Lawrence D Ely

THE MEDICAL SCIENCES
IN THE
GERMAN UNIVERSITIES

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THE MEDICAL SCIENCES

IN THE

GERMAN UNIVERSITIES

A Study in the History of Civilization

TRANSLATED FROM THE GERMAN OF

THEODOR BILLROTH

WITH AN INTRODUCTION BY

WILLIAM H. WELCH

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INTRODUCTION

That a book on medical education published nearly fifty years ago should appear now for the first time in English translation may seem to demand an explanation, if not an apology, when one considers the ephemeral nature and the mainly local or merely historical interest of the great mass of writings on this subject. For those acquainted with Billroth's "Lehren und Lernen der Medicinischen Wissenschaften" in the original no explanation is needed; for others the perusal of this English translation will furnish the key to the explanation. An apology for the neglect to supply an earlier translation is less easy to offer. Here is a work of enduring value, characterized by a breadth of view and the enunciation of certain general principles as sound and as needful of utterance today as when they were first expressed; a book, moreover, singularly suggestive and stimulating in its discussion of many fundamental as well as detailed problems of medical education, which are still of vital interest, especially in this country at the present stage of development of our medical schools.

There are several reasons for the exceptionally important position held by Billroth's book in the literature of medical education.

No one better qualified by training and experience has written upon the subject. Coming as a student in the middle of the last century under the influence of such inspiring teachers as Rudolf Wagner, Johannes Müller, Schoenlein, Von Graefe and B. von Langenbeck, Billroth had for a quarter of a century been an active and successful teacher, investigator and surgeon in three important universities; first as Langenbeck's assistant and as docent in Berlin, next as professor of surgery in Zurich, and since 1867 professor of surgery in Vienna, whence, by the time of the publication of this book, his fame had spread throughout the world, being carried especially by the translation of his great work on "Surgical Pathology" into the languages of nearly all civilized countries.

Billroth combined in unusual measure scientific and practical interests. His early work was in the field of pathological histology, and he continued to the end pathological, bacteriological and biological studies, although his main contributions are to surgery. He was far from indifferent to the material rewards of practice, and does not hesitate to confess that this financial consideration was a part of the inducement which led him to the career of a surgeon in preference to that of a pathological anatomist, in which a professorship had been early offered him. The reader of Billroth's "Letters," published two years after his death in 1894, will realize how much social, cultural, artistic, especially musical, interests meant to him outside of his professional life. In spite of a certain critical spirit and even discontent which pervades these fascinating letters, it may be said that Billroth "warmed both hands before the fire of life."

The pages of this book will afford, even in translation, abundant evidence of Billroth's literary gifts, his vigor of expression, his epigrammatic wit, his clear and logical thinking, his historical sense, his practical wisdom and hold on reality, his thorough command of his subject, his courage and independence of thought and utterance without regard to consequences, and his devotion to truth.

It is not surprising that the plain-speaking of this book regarding certain conditions then existing in the University of Vienna, especially his remarks concerning the lack of cultural, family background and the dire effects of penury on many of the medical students created a sensation at the time and aroused much antagonism, attended even by racial and riotous disturbances.

A principal interest of Billroth's book is that it traces the historical development of medical education, especially in the German universities, as indicated by the title, and sets forth the underlying ideas and conditions of medical teaching, study and research in these universities, at a time when they had far outstripped those of other lands in their plan of organization, scientific spirit, facilities for imparting knowledge, and productivity. They offered advantages for scientific and practical study never before attained, and to this day hardly equalled, certainly not surpassed, in other countries throughout the whole field of medicine. The amazing rise of the German universities to a position where they had become the Mecca of aspiring students from other countries had been the work of scarcely more than the three decades immediately preceding the publication of Billroth's famous book. These were the days (when and where are they to be matched?) of Henle, Hyrtl, Kölliker, His, Waldeyer in anatomy, of DuBois-Reymond, Ludwig, Pflüger, Brücke, Heidenhain in physiology, of Hoppe-Seyler, Kühne, Voit in physiological chemistry, of Virchow, Von Recklinghausen, Klebs, Cohnheim, Weigert in pathology, of Frerichs, Traube, Wunderlich, Kussmaul, Von Ziemssen, Wagner, Leyden in internal medicine, of B. von Langenbeck, Voltmann, Billroth, Thiersch, Esmarch in surgery, and in various specialties of Von Graefe, Arlt, Hebra, Kaposi, Politzer, Sigmund, Credé, Meynert and many others of distinction. One of the fascinating parts of this book of Billroth is the tracing of the medical lineage of these and other great university teachers, and the consideration of the influences and qualities which made them leaders around whom gathered hosts of pupils. Billroth's conscious national pride in the position attained by the German universities at this time cannot justly be attributed to him as an offense, even if at times, although rarely, it approaches chauvinism.

However much one may question the possibility or the desirability of transplanting bodily the ideas, methods and organization of medical teaching of one country to the soil of another, there are surely valuable lessons to be learned from acquaintance with those which have proven successful elsewhere and which may be modified or adapted to a new environment. In this sense those concerned with medical education cannot fail to be interested in Billroth's discussion of certain distinctive features of the German universities, such as freedom of teaching and of learning (Lehr- und Lernfreiheit), absence of compulsion in the order, choice and duration of studies other than that imposed by examinations, release from division of students into classes according to fixed annual courses, the advantages of the wandering of students from one university to another, the docent system, the competition between teachers of the same subject in the same and in different universities, and the relation of "Collegiengelder" (students' fees) to this system. There is growing recognition among us of many advantages attained by these methods and regulations, however remote may seem the adoption of some of them in identical form in this country.

The great service, however, rendered by the present publication is that it makes available to English readers an extraordinarily interesting collection of facts concerning medical education, propounds certain fundamental educational principles of universal application to the study of medicine, and discusses many problems of vital interest and pressing importance to the sound development of our medical schools, with an unsurpassed wealth of knowledge, experience, authority and illustration.

No one has expressed better than Billroth the importance of a liberal and scientific training in preparation for the study of medicine, has struck the balance more justly between the functions of the University as Schola and as Academia, has described more eloquently the personal tradition, influence and significance of the great university teacher, has dwelt more forcibly upon the importance of maintaining the integrity of the great, central clinical departments, has pointed out more convincingly the dangers of inbreeding, or has condemned more unsparingly the substitution of superficial routine for thorough grounding in sound methods and scientific principles in the training of medical students.

Many of his pithy sayings have passed almost into proverbs, as: "Most physicians learn routine only too quickly in their practice"; "The only sure way to develop capable university teachers is to secure the most scientifically important men for the chairs and give them their opportunity"; "Personal tradition operates far more intensively than all the books"; and many more.

There are few of our present-day problems of medical education which are not considered in this book. Even the scarcity of doctors for rural districts was regarded as an urgent problem at least half a century ago, as it has continued to be so regarded by some up to today. Billroth's suggested remedy is the same as that now recommended.

Among the many important topics discussed by Billroth are to be found the desirable number of medical schools in relation to population and territory, the constitution and powers of the faculty and its governing body, the curriculum, the relative importance of the different subjects and the provision to be made for each, the size of classes, the relation of the teaching hospital to the school, the number of beds in ratio to the number of students, the organization of clinics, the ambulatory service, the position of the specialties and their relative importance, the total cost and the separate budgets, the selection of professors, the relative value of lectures, demonstrations and practical training, the importance of inducting the student into the principles, the methods and the spirit of science as well as training in practice, the desirability that medical teachers should conduct the state examinations for licensure, the question of separate faculties of the natural sciences and medicine, the matter of securing an adequate supply of capable teachers in training for the academic career in order to fill vacancies in the different departments, and many other subjects, including even adumbrations of the full-time system, of immediate interest to the medical educator. As might naturally be expected, the part relating to clinical teaching, the training of clinicians and the organization of clinics is particularly interesting and valuable.

Among the charms of the book are the side-lights occasionally thrown upon Billroth's very human prejudices, prepossessions, even limitations, by his impressionistic rather than considered statements upon some of the topics. Not a few will sympathize with his remarks upon courses in propædeutics and topographical anatomy, the lack of intellectual content of some of the narrower specialties, the pressure to inject all sorts of new subjects into the curriculum, the retention in the general medical and surgical clinics of a sufficient number of patients with special diseases for study and demonstration to students. The little that he has to say upon the teaching of the history of medicine is admirable, so far as it goes.

His zeal for placing no restrictions upon the private practice of clinical teachers leads him to the rather startling statement that the clinician so engaged is doing in his special professional line the same thing as the physiologist in his when engaged in work in his institute! The strong sense of responsibility and the high scientific ideals of the heads of the German clinics at this time kept within bounds for the most part their outside practice, nor were the demands of scientific and practical medicine upon the time of the director of a clinic fifty years ago commensurate with those of the present day. Billroth states, however, that a number of clinicians voluntarily declined all private practice.

Even more startling at the present time is Billroth's confession to a lack of interest—a "myopia" he calls it—in respect to public health and the diseases of the community, as distinct from those of the individual. With the immense progress since his day in the prevention of disease and the protection of health so frank a confession would not now be expected, but there is reason to believe that the vision of not a few members of the profession in matters of public health remains today as short-sighted as that of Billroth. Still in his "Ordo" of the nine professors who should constitute the inner or restricted medical faculty is included, as the ninth, the chair of "social medicine" (medical jurisprudence, public health, hygiene).

An even more curious, although not unprecedented, instance of "myopia" is Billroth's prediction, on the very eve of Koch's and Pasteur's revolutionary discoveries in the causation and control of infectious diseases, that it is not to be expected that the medical sciences will continue to advance at the pace which they had maintained up to that time during the nineteenth century. One is reminded of the statement of the famous French surgeon Boyer, in the early part of the same century: "Surgery in our day has made the greatest progress, and appears to have attained, or nearly so, the highest perfection of which it is capable." Billroth's short-sightedness in this particular is the more remarkable as he had made important contributions to bacteriology, and the publication of his studies of "Coccobacteria septica" preceded by only two years that of this book.

While, as is naturally to be expected, with the lapse of half a century, some modification and correction of Billroth's statements and conclusions must be made, and while with the progress of medical science new educational problems have arisen, it is surprising how little allowance need be made on this score in estimating the value of this book for our day and generation. Nor is it necessary to agree with every opinion and inference expressed by Billroth in order to appreciate the general soundness of his judgments and conclusions, the intensely stimulating and interesting character of his discussions of present-day problems, and the wealth of material for thought and study presented in this outstanding contribution to "the teaching and the learning of the medical sciences."

William H. Welch.

Baltimore, June 15, 1924.

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THE MEDICAL SCIENCES IN THE GERMAN UNIVERSITIES

PART I

THE DEVELOPMENT OF THE FACULTIES OF MEDICINE AT THE GERMAN UNIVERSITIES

The Early Universities.—A study of the development of the medical faculties of our universities into their present form reveals the fact that our present conception of a "Medical Faculty" is a very modern one. In many respects indeed this is true of our conception of the university itself.

It is not my intention to present in these pages a history of the development of the German universities; but it is impossible to make the evolution of the medical faculties intelligible without touching on the development of the universities, of which they were formerly a comparatively unessential part, but of which they have come to form if not the most essential, at all events the costliest department.

As long as the art of healing has been practised, it has also been taught; at first orally, later by means of written records supplemented by oral teaching. The direct transmission of the physician's art from teacher to pupil has always been very important. Even today we can speak more properly of a scholastic tradition in connection with medicine (in so far as the work of the physician is concerned) than in connection with any other science. It is quite correct to distinguish between medical science and the physician's art.

A person may have acquired from books a vast amount of medical knowledge, he may even have memorized from books the technic of its application; such a person has much knowledge of medicine, and yet with it all he is no physician. He must see and hear a master's diagnosis, prognosis, and treatment of disease. He must witness the master's skill in action, in order himself to become a practitioner. The more he knows, the more he will be able to accomplish later. Now the object of our modern endeavor is to make the physician's skill independent of tradition, and by means of written records to conserve the art of healing for all time, so that it may be independent of the talent of the individual and may be reduced to an absolute science. All knowledge and skill are to be determined and controlled by means of the laws of arithmetic and logic in order to make everything absolute and permanent. How long have we been seeking absolute truth and absolute beauty! "Ye shall be as gods, knowing good and evil."

I doubt if this goal will ever be reached—at least in the art of healing; certainly not until the art of poetry is wholly resolved into prosody, the art of painting into chromatics and the art of music into acoustics. The physician, like the artist, must constantly produce and reproduce. Disease processes and disease products which lie veiled before him must crystallize out of the many direct and indirect sense impressions in his mind into a picture which wil become clearer and more nearly correct the more he knows about these disease processes and disease products. But this knowledge is of no value to him if he lacks imagination and the power of synthesis The student can learn to develop this power, to practise it, to guard against errors, only by observing a master in action.

Medical tradition goes back to the priests in the temples of Æsculapius. Hippocrates clothed it in scientific form for the Greeks, Galen for the Romans, and Avicenna for the Arabs. We have, therefore, a Greek, a Roman, and an Arabian canon. In the Middle Ages the universities elevated these forms to the dignity of dogmas, and these alone were taught at the universities. Direct transmission of experience from the practising physician to the student was excluded from their curriculum, and not until the middle of the eighteenth century was it introduced among the medical facul ties, at first at Leyden, and usually against the violent opposition o the "graduate doctors."[1]

Until that time the method of teaching through practice was to be found almost exclusively in the guild of surgeons, which had developed among lay healers, Roman gymnasts and barbers. The greater part of medical practice was in their hands. Pupils were apprenticed to the masters of this guild. When these masters learned to read Hippocrates, Galen, and Avicenna, and then not only *knew* all that the doctors who had come from the universities knew, but could usually *do* a great deal more, violent struggles between the two medical orders ensued. In Paris, for example, there developed two centuries of conflict between the Collège St. Côme (the surgeon's guild) and the Faculty of Medicine, in which the former was finally victorious.

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[1] Billroth uses the Latin phrase "*doctores rite promoti.*" The term signifies those regularly granted the degree of Doctor of Medicine.

The early "universities" and schools of philosophy were informal communities of teachers and students. They usually crystallized about some person or group with a wide reputation for learning. In Athens, in Alexandria, and in Rome there were high schools in this sense. To what extent the state in the days of the Roman Empire concerned itself with these schools, we can no longer precisely say. The combination of subjects thus taught was probably quite accidental; it was dependent on those who wanted to teach and to learn. Medicine seldom came within the range of these schools; more frequently they taught the natural sciences, which were included in the study of cosmology. The designation "Medical School" first came into use to describe the gradually crystallizing groups of teachers of medicine, as, for example, in Salerno in the ninth century. There Greeks, Jews, Latins, and Arabs taught medicine—i.e., they read the writings of the Greek, Roman, and later the Arab physicians named above, from old parchment rolls, and expounded them to their students.

The Hohenstaufen Emperor Frederick II is reputed to have been the founder of the first so-called universities. Naples, Messina (1224), Bologna, Padua, Pavia (1250) are the oldest seats of learning sanctioned by the imperial government. Paris was founded as early as 1205; Salamanca followed in 1243. Four of these universities—Bologna, Naples, Paris, and Salamanca—were later recognized by Pope Alexander IV as "the four general schools of the Christian world,"[1] although at Salamanca, especially, many Jews and Arabs lectured on mathematics, astronomy, and other subjects.

Originally then, founding a university meant that the state (in those days the sovereign) recognized a given community of teachers and students as a corporation, and as such bestowed upon it certain privileges, for example, jurisdiction over its own members, subsidies, exemption from taxation, and the like, and above all gave it the right to grant degrees; in other words, the right to confer honors which brought with them certain social privileges, and which the sovereign himself refrained from granting. For the rest he did not care what was taught in these universities or how it was taught. The university was a scholastic community much like the municipal community: a class corporation, a sort of guild, a state within a state, subject only to the sovereign and the Pope. It soon followed as a matter of course that all students and teachers became members of this guild. The liberal arts—namely, philosophy and the natural sciences—formed the essential curriculum of these higher institutions of learning.

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[1] "Quattuor studia generalia orbis christiani."

The University of Paris seems to have been the first to work out a systematic division of the university into faculties. On the model of Paris, Prague was founded in 1348, and Vienna in 1365. I have had free access to the archives of the University of Vienna, and since I am most familiar with that university, I shall use it as an example in describing the universities of the period. For the same reason I have chosen the medical faculty of Vienna as typical in my exposition of the gradual development of these faculties at German universities.

The charter of the University of Vienna, granted by Duke Rudolph IV, is dated March 12, 1365. According to its terms, the university was planned on a large scale; its endowment was to be almost an entire section of what was then the city of Vienna. At the same time the provostship of St. Stephen was created; the provost was to be the chancellor of the university and was to appoint the rector, while the university itself was to be in the service of the church. Confirmation of the charter by Pope Urban followed on June 28, 1365, but Duke Rudolph died on July 27, 1365, and very little of the whole plan was carried through. Not until 1384 did Duke Albrecht take the matter up again. This Albertian foundation is the basis on which the university developed. The donations that were finally provided and legally validated were far smaller than those of the original Rudolfian foundation.

The teachers and students were divided first into four so-called "nations," each with a procurator at its head, and again into four "faculties," each with a dean at its head. The term "nation" is not to be taken in the modern sense, for notwithstanding the designations "Austrian, Rhenish, Hungarian, or Saxon Nation," it represented an approximate division of the Western World into four sections, using Vienna as a center and basing the division roughly on the points of the compass. The nations, with the rector and procurators at their head, were purely social and political groups, but while they were far more effective than the faculties (controlled by the rector and the deans) in obtaining special privileges for the university as a corporation, they had no educational significance at all. In the course of the centuries they completely disappeared, and their privileges were assumed in part by the Government, and in part by the chancellors, rectors, and deans, who later became the highest authorities at the university. The university statutes had taken shape as early as 1385; the faculties did not complete their statutes until 1389.

At first the Pope was unwilling to grant the University of Vienna a theological faculty, a reluctance which was evident in the case of several universities founded at the time. Not until 1384 was permission to establish this faculty obtained from Pope Urban IV. Since that time Vienna has always had four faculties. For a time, however, there were not enough teachers available, and Duke Albrecht brought in a number of men from Paris. The permanent staff of teachers, later called the *doctores actu regentes*, was never very large, notwithstanding the rapid increase in the number of students. At the beginning of the fifteenth century this number is said to have risen to 7,000. In 1384, when lectures began, there were three regular teachers in the medical faculty, this staff being later increased to five. These were assisted in their teaching by the Licentiates and by the younger doctors recently graduated. The Bachelors also assisted as tutors.

In the Middle Ages, when the treatment accorded a man was determined by his rank rather than by any other consideration, the right of the universities to confer academic honors—which implied an advancement in social standing—was of far greater importance than in our own day. The state no longer regards the granting of an academic degree as carrying with it an elevation in rank. Nevertheless, the sovereign, who confers all other titles and honors, even now refrains from granting the title of Doctor, delegating this right exclusively to the universities.

The Student Body.—In order to understand the method of instruction then prevailing, it is necessary to inquire briefly into the relations existing between the students and the different grades of teachers.

There does not seem to have been a definite age requirement or a definitely prescribed preparation for students entering the university corporation. By modern standards the university of those days was at once high school[1] and college. Since the vernacular was prohibited in the technical instruction in the faculties, those students who had not already acquired Latin in the monastic or other clerical schools had to learn this language in the faculty of the liberal arts.

The students were lodged in the city, in communal boarding-houses called *bursae,* and supervised by the Bachelors and Licentiates.

After a student had completed two years of study in the faculty of arts, in which the seven liberal arts (grammar, rhetoric, dialectic, arithmetic, geometry, music, and astronomy) were taught, and after he had passed the prescribed examination, which was given four times a year, he became a Bachelor of Arts. As such he was still a student, but he wore a different costume and had certain duties in connection with the boarding houses; he was also expected to conduct recitations and direct the first exercises in elementary disputations.

Although it had long been the custom to demand of those who entered the theological, juridical and medical faculties approximately the degree of attainment expected of a Bachelor of Arts,[2] it was not until 1469 that the medical faculty laid down its entrance requirements. Under the terms of that decision the degree of Master of Arts was prerequisite for admission to the faculty of medicine. This was a very severe requirement, especially since thereby the time required to obtain the medical degree was very much lengthened. Not until a student had the master's degree did he begin his medical studies proper, and these had to be continued two or three years before the candidate became a Bachelor of Medical Arts and was permitted as such to take part in the recitations and disputations of the medical faculty. The Bachelor was not, however, permitted as yet to practise independently, and had to take an oath that he would not do so.

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[1] Billroth here uses the word "Gymnasium." The German *Gymnasium* course is about equivalent to the American four-year high school course and the first two years of college.

[2] The examination for that degree probably corresponded in a general way to our high school graduation plus two years of college.

After further studies lasting two or three years he could become a Licentiate of the Medical Arts. The examinations for this degree were given only once a year; the most important parts of the examination were several disputations, in which the chancellor himself took part. After completion of all the conditions set by the faculty the Licentiate was granted. The Licentiate was permitted to wear the master's garb, but without the hood.

To obtain the degree of Master there were now required only several public speeches (not disputations) and the solemn act of graduation at St. Stephen's, inaugurated by the ringing of the great church bells. This ceremony was the concern of the faculty, even though it was under the supervision of the chancellor, and not the rector. The licentiate was given the hood, then an open and a closed book, and then the kiss of peace. The newly created Master was obligated to teach for a year or two in the faculty from which he had obtained his degree, without being limited in any way as to the matter or scope of his lectures. Only as long as he taught did he belong to the faculty, and as a teacher his distinguishing title was that of doctor.

The licentiates and recently graduated doctors soon formed a very considerable group of assistants and adjuncts to the regular teachers, so that the latter scarcely more than supervised the instruction and attended to the business of the faculty.

The properly accredited Master of Medical Arts had the right not only to teach in any part of the Occident, being as a rule received in any faculty after having satisfied a few formalities, but he could practise anywhere and in any way he pleased.

The vacation of the medical faculty lasted only from September 7 to October 18; that of the faculty of arts from July 13 to October 13.

Methods and Curriculum.—In considering the method of instruction in use at that time, we must keep in mind that when the first universities were founded there were no printed books, and that the art of writing and reading was not too common; further, that there was as yet no practical instruction in anatomy and at the bedside. Studying, then, could consist only of memorizing and copying. The latter had a practical value only for those who wanted to go elsewhere to teach, since it was not practicable for them to carry the parchments with them. Hence the most important consideration in the method of instruction was to get the students to commit the subject matter to memory.

First of all, then, the authors were read aloud and the texts discussed. These disputations were the chief means of completely grasping the content of the books and of keeping that content always before the student's mind.

As has already been stated, the teachings of Hippocrates, Galen, and Avicenna were the medical dogmas. The works of Aristotle and Euclid served as preparatory matter. Knowledge of Greek was at the time very rare; knowledge of Arabic rarer still. Only the very inferior Latin translations of the works of Hippocrates and Avicenna were authoritative. The aim of teaching was not only to know the contents of these works as completely as possible, but to defend them as infallible by the art of dialectic against all possible objections.

From the days when the Alexandrian School flourished (about 300 B.C.) down to the appearance of the anatomists Mondino and Vesal, there had been no real medical research. Practice, to be sure, developed by way of a gradually refined empiricism, but in the medical faculties there was no research; only existing medical literature was taught. The fame and distinction of a teacher in the faculty depended on the extent of his reading, and on his skill in so commanding the considerable store of his memorized knowledge that he could support by quotations all that he knew. The only scientific development that took place in the medical faculty consisted in gradually bringing more and more Greek, Alexandrian and Roman authors within the scope of teaching and study, and in providing these with glosses, which often consisted merely of quotations of analogous points from other authors and seldom contained the results of experience. The scholastic material gradually increased so greatly in volume that the original text of Hippocrates could hardly be recognized.

If any person allowed himself to be carried away by his dialectic to make assertions that were too bold, he had to retract or he was excluded from the university. The form and method of teaching gradually outweighed knowledge and subject matter to such a degree that in the end men seemed to study only for the sake of the disputations. Learning and knowledge seemed to exist solely for the defense of the dogmas. Thus the disputations became ends in themselves, and the doctors went forth to learned sham battles much as the knights went forth to their tournaments.

In order to get some idea of the content, the actual subject matter taught in the medical faculties, and see how this material was arranged and subdivided, it will probably be best to give a short analysis of the Canon of Avicenna, one of the most famous text books of those days, which was valued even more highly than Galen's work, with the contents of which it is in entire agreement. This work contains in its completest form the so-called "recognized books."[1] The following is an extract based on Haeser's analysis.

Avicenna's Canon is divided into five books which were studied in order:

Book I,	Part 1.	The Institutes of Medicine: Definition of Medicine, its task, its relation to philosophy. The elements, juices and temperaments. The organs and their functions (Anatomy and Physiology).
	Part 2.	Causes and Symptoms of Disease (General Pathology and Etiology).
	Part 3.	General Dietetics and Prophylaxis (Hygiene).
	Part 4.	General Therapeutics.
Book II.		On the simple medicaments and their isolated action (Materia medica).
Book III.		The diseases of the brain, the eye, the ear, the throat and mouth cavity, the respiratory organs, the heart, the breast glands, the stomach, the liver, the spleen, the intestines, the kidneys (Urology), the sex organs (Special Pathology, Surgery, and Obstetrics).
Book IV,	Part 1.	On Fevers (Acute and Zymotic Diseases).
	Part 2.	Symptomatology and Prognosis.
	Part 3.	On Sediments (Phlegms, Erysipelas, Scrofula, Cancer, Leprosy).
	Part 4.	On Wounds.
	Part 5.	On Dislocations (Fractures and Luxations).
	Part 6.	On Poisons and Cosmetics.
Book V.		On the Compounding of Medicines (Pharmacy).

It is clear from this summary of the contents that all the medical and surgical knowledge of the period was contained in this "Canon." The manner of its arrangement corresponded to the matter. We now have a rather different grouping; but the change has taken place only within the last hundred years. Even the "Institutes" and "Aphorisms" of Boerhaave, dating from the beginning of the last century, as well as the works of Boerhaave's pupil, Van Swieten, show in the approach to and arrangement of their material a much closer relationship to the Canons of Avicenna and Hippocrates than to similar works of more recent times. The strength of this scholastic tradition in the field of medicine was tremendous. It was almost two hundred years before the advances made by anatomy and physiology in the sixteenth century were generally recognized by physicians, and the results of research incorporated in the system of medicine.

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[1] "Libri ordinarie legendi."

The Medical Faculties.—The conditions here described at one university and in one medical faculty were the same at all the universities of the Christian Occident. The language of the classroom was Latin everywhere. Graduated doctors were accepted as teachers after complying with a few formalities, wherever they might be needed, and often went from place to place. The Master of Medicine could practise anywhere, and members of universities could travel where they pleased. There was only one system of medicine, set forth in the Latin language and composed of Greek, Alexandrian, Roman, and Arabic elements. Its teachings and its science were quite international. The following historical data will serve to demonstrate the resemblance in the make-up of the faculties of medicine of that time.

When Prague was founded in 1348 there was in the medical faculty only one teacher, Balthasar von Taus, who lectured at his own home. But Master Walther, formerly physician to King John of Bohemia, had the right to deliver lectures at the parish school at Teyn, on medicine, natural science, and liberal arts.

Heidelberg, founded in 1386 by the Elector Rupert I (the authorization of Pope Urban VI was issued in 1385), had when its lectures began on the 19th of October only the faculties of arts and of theology, although the law course began only a few weeks later. The medical faculty did not come into being until 1387, the first two teachers being Ostkirchen and Jacobus de Hermenia. Later the medical faculty frequently consisted of but a single teacher. Until 1482 all teachers of medicine had to be members of the clergy; the Elector Philip had great difficulty in having Jodocus, a layman, appointed teacher of medicine. The employment of laymen was not legally authorized until 1553.

Leipzig was founded in 1409. There is no mention of a medical faculty until 1415, in which year a medical college of seven members came into being. Permanent teachers of medicine, one for pathology and one for therapeutics, were appointed in 1438; the latter chair was always occupied by the older teacher, and until 1796 it carried with it the deanship. In 1531, on the basis of a bequest, a third professorship was founded, in physiology, and was called Tockleriana in memory of the donor; in 1543 came a fourth in anatomy and surgery. These were the professorships of the "Old Foundation." In 1712 the first professorship of the "New Foundation" was added, in chemistry.

Rostock, chartered in 1419, was opened without a theological but with a medical faculty. The teachers at this university were for the most part called from Erfurt and Leipzig; the institutes of Erfurt were the models on which Rostock was based. From 1437 to 1443 the University of Rostock was removed to Greifswald because of conflicts with the citizens. For the same reasons it fled to Lübeck in 1487, returning once more to Rostock in 1488. At first there seem to have been two, or at most, three teachers in the medical faculty.

When Greifswald was founded in 1456 by Duke Wratislav IX of Pomerania and the Burgomaster of Greifswald, Heinrich Rubenow, only one doctor taught in the medical faculty, Vitalis Fleck of Merseburg. Not long thereafter the faculty was strengthened by the admission of two other doctors, Nicolaus Degantz and Canon Johann Stalkoeper.

Freiburg, founded in 1457 by the Archduke Albrecht, was opened in 1460 with a medical faculty of two members, one teaching theory (the institutes), the other practice (therapy). Later the chair in theory came to include botany, anatomy, and physiology, and the chair in practice the whole of pathology and therapeutics. Because of the lack of funds the medical faculty was later, under Jesuit control, badly neglected, so that in 1750 Master Strobel alone constituted the entire medical faculty. With great effort he finally secured the appointment of a teacher of theoretical medicine, and a third for anatomy.

At Basel, founded in 1460, there were at first only two teachers of medicine,—one of theory, the other of practice. This condition continued down to the middle of the sixteenth century.

At the founding of Tübingen in 1477 two doctors were appointed to teach medicine.

Development of Anatomy.—We may now for the time being close our account of the establishment of medical faculties, in order to discuss the introduction of anatomical instruction in the course of the sixteenth century, and the consequent introduction of surgery as a separate subject of instruction in the medical faculties. These two sciences were in a sense detached from the Canon of Avicenna, which in other particulars remained in its original form. Later chemistry and botany, which had been taught according to Aristotle in the faculty of arts, were gradually put under the jurisdiction of the faculty of medicine. That the introduction of printing in the middle of the fifteenth century was bound to have a great influence on the method of teaching need scarcely be emphasized.

Concerning the revival of anatomy, which since the heyday of the Alexandrian school had been almost completely neglected, Haeser reports that "the earliest information in this field again points to Italy." Apart from the unauthenticated statement that Frederick II, the Hohenstaufen, had ordered the teachers of Salerno to open a human corpse from time to time, there is, according to Renzi, in the archives at Venice, a decree of the Great Council dated May 7, 1308, which commands the medical college of this city to "undertake one dissection each year." Mondino de Luzzi in 1344 wrote the first treatise on anatomy based on personal work in dissection. This was first printed in Venice in 1478. Nevertheless, dissections, practised usually on the corpses of criminals, remained rare occurrences. The permission of the Pope and the secular authorities was required before they could be performed. They occurred most frequently at the Italian universities, especially at Bologna. Then in 1376 the medical faculty at Montpelier obtained permission annually to dissect the body of an executed criminal. At times, however, such rights were withdrawn.

One must be careful not to overestimate the knowledge which the anatomists of that day gained from their own observations. Vesal, whose chief work first appeared in Basel in 1543, was the first to set forth a human anatomy which can be looked upon as the result solely of his own research. He was violently attacked and persecuted, because his work in many points contradicted the teachings of Avicenna and Galen. It seems incredible to us that doubt could exist about the correctness of an observation in descriptive anatomy, since the confirmation of such an observation seems so simple a matter. And this was only three hundred years ago. So young is modern medicine!

Let us now review rapidly the development of this new teaching in the medical faculties of the German universities still in existence.

At Prague, it is said, the hangman was from the very beginning (1348) under orders to deliver subjects to the medical college. The first anatomical demonstration before a medical faculty seems however to have been made in Vienna, and that as early as 1404. Since there was no teacher of the new subject in the country, Duke Albrecht IV brought in an Italian anatomist, Galeazzo de St. Sofia, to introduce the art of dissection. Johann Aigel was the first permanent teacher of anatomy, and as a result of his efforts anatomical demonstrations were after 1433 made a required part of the medical curriculum.

At first only the dissection of male corpses was permitted, a restriction which was not removed until 1452. The first anatomical demonstration upon a female body was performed by Michael Puff von Schrick. As early as 1459 we find two doctors conducting the demonstrations from February 22 to March 12, one of whom was already designated as dissector or prosector. These demonstrations were done at the cemetery of the municipal hospital; not until 1484 were they transferred to the faculty building.

Basel played a most important part in the development of anatomy and its teaching. After Vesal, 1546, then Felix Plater, and in 1580 Caspar Bauhin had conducted anatomical demonstrations with extraordinary success, a new professorship of anatomy and botany, the third in the medical faculty at Basel, was created in 1589, and was conferred on Bauhin, who for eight years had been professor of the Greek language.

It has already been mentioned that chairs in anatomy had been established at Leipzig in 1543. At Freiburg there was none until 1750.

At Rostock the faculty applied in 1567 to the city council for permission to dissect bodies, and in 1572 one of the professors was commissioned to undertake these demonstrations.

I have been able to gather the following information concerning the founding of the medical faculties of the universities which were established in the sixteenth and seventeenth centuries:

The University of Marburg was founded in 1537 by Landgrave Philip of Hesse as the first Protestant university in Germany. The charter, dated August 31, 1529, provides in the faculty of medicine for one doctor "who shall interpret to our students besides physics and pharmacy, the aphorisms of Hippocrates and the other books of Galen and Avicenna in their order." In 1653 Landgrave William granted new "Privileges of the University of Marpurck." These state that "in the faculty of medicine there shall be at the outset two doctors who, in addition to theory, shall teach the youth the practice of anatomy and botany."

It is indicative of the then prevailing method of instruction that the professors are ordered not to dictate too much, and to conduct disputations twice a week.

Würzburg was founded in 1583, with statutes providing for two professors, one of theory and one of practice.

The University of Gratz, founded in 1585, was opened on April 14, 1586, with a medical faculty and a faculty of arts. In 1778 the faculty of law was added. On the expulsion of the Jesuits, the school was in 1782 deprived of its rights as a university by Joseph II, and was changed into a lyceum, in connection with which a school of medicine and surgery was later founded. This was added to the reconstituted university in 1827, together with the theological, juridical, and philosophical faculties. A medical faculty on modern lines with the right to grant the degree of Doctor of Medicine was not organized until 1863, and was then incorporated in the university as a fourth faculty.

The University of Giessen was founded in 1607. In 1629 its medical faculty had three professors, one of whom probably taught anatomy.

Dorpat received a university through the efforts of Gustavus Adolphus, King of Sweden, to whom the provinces of Esthonia and Livonia were at that time subject. The charter is dated at the camp at Nuremberg, June 30, 1632. The medical faculty began work on October 15, 1632, with three professors, but was dissolved again in 1656 when the Russian army besieged and captured Dorpat. When the Russians evacuated Dorpat the university resumed its work and continued until 1699, probably without a medical faculty. It then fled before the Russian army to Pernau, where it continued activity of a sort until this fortress was captured by the Russians in 1710. The medical faculty does not seem to have been re-established during this period. Although Czar Peter I ordered the maintenance of the university, and clothed it with many privileges, with especial consideration for the education of his Lutheran subjects, and although in 1799 Czar Paul confirmed these privileges and earnestly desired to further the establishment of the university, these plans were not realized until 1802, under Emperor Alexander. He founded the University of Dorpat anew, providing for a medical faculty of four professors, the first among them in the field of anatomy, physiology, and medical jurisprudence.

The University of Kiel, founded in 1665, had a medical faculty from the beginning. But the number of medical students remained so small that until the middle of the eighteenth century there were at most two professors engaged in this work. Not until 1744 was a special anatomical demonstrator appointed.

Innsbruck was opened in 1672 with a medical faculty in which at the beginning two professors were engaged, one for the Institutes, the other for Practice. But as early as 1689 a third professor was engaged to teach anatomy, and a fourth to teach the aphorisms of Hippocrates.

I have not been able to discover whether at the founding of the University of Halle, 1689, there was a medical faculty, or, if there was one, how it was constituted in the first centuries of its existence.

Göttingen (founded 1733, first enrollment 1734, formal inauguration 1737) had a medical faculty from the start, at first with three professors, Blumenbach, Himly, Osiander; later with four, Blumenbach, Himly, C. M. Langenbeck, Stromeyer. Although the division of the subject matter at this seat of learning is not known to me, there is no doubt, judging from these names, that anatomy was taught thoroughly and as a specialty by one of these professors.

General Science and Surgery.—That instruction in anatomy with demonstrations was introduced so late at many universities is due in part to the fact that this new subject was very inconvenient to the older professors. Then, too, both anatomical demonstrators and material were scarce. There was as yet little opportunity to make anatomical examinations of human bodies, since it was difficult to procure the latter in the smaller university towns.

The time when students were to participate in anatomical exercises was still far distant. The now generally prevailing method of instruction in anatomy is scarcely more than a hundred years old. At Greifswald, for example, the first professor of anatomy and physiology was not appointed until 1820; until then these subjects were taught by the professor of the institutes.

Even more difficult than the dating of the first instruction by means of anatomical demonstration is the problem of determining when chemistry and botany were first introduced into the various faculties as separate lecture courses. Connected with this question is the erection of the first chemical laboratories and the establishment of botanical gardens. As has already been pointed out, the natural sciences, mathematics and astronomy were at first taught in terms of Aristotle and Euclid. Doubtless the teaching of materia medica had always involved some reference to botany and chemistry; but separate lectures and professorships for these subjects in the medical faculties did not develop until the seventeenth or eighteenth century, and then for the most part only at the great universities. The complete differentiation of these teaching posts and their occupation by special teachers did not become general until toward the middle of the nineteenth century.

The combination of botany and chemistry with the professorships of the institutes, of practice or of anatomy was very common. The combination of chemistry and botany into one professorship was also frequent. We do not hear of a professor of botany alone at Vienna until 1629, and there was no professor of chemistry until 1712. At Basel in 1589 anatomy was combined with botany in charge of Caspar Bauhin. At Marburg in 1653 botany was combined with semeiotics and pathology. At Würzburg a professorship of surgery, botany, and pharmacology was created in 1587. At Kiel botany was combined now with anatomy, and again with medical practice. In 1798 a Professor Pfaff taught physiology, pathology, chemistry, and physics at Kiel. At Innsbruck a chair for botany and chemistry was first created in 1774, after a similar project had previously been abandoned for lack of funds.

Zoölogy was taught under the designation "natural history" in the faculty of arts, or in the medical faculty, by anyone who volunteered to do the work. Separate professorships in zoölogy, mineralogy, geology, and physics are, like the rise of these sciences to their present interesting and significant content, a very modern development; and only toward the middle of the nineteenth century were these courses included in the medical curriculum.

Surgery, too, gained a firmer foothold in the universities in the seventeenth and eighteenth centuries. It appears from the content of the Canon of Avicenna given above that surgery, obstetrics, and the diseases of the eye and ear were included. The mysteries of treating internal diseases could be handed down, under the protection of periwigs, the Latin language, and yard-long recipes concealed in cabalistic formulæ; and the formal medical lectures, with disputations, might have dragged on for several centuries, until control of the medical syllabus by pathological anatomy had spread even to the universities. In the field of *external* diseases, on the other hand, the effects of treatment were so obvious that mere book knowledge could make no stand against an empiricism developed by intelligent, dispassionate, observant men. Nevertheless, the surgeons and barbers would not so easily have succeeded in coming closer to the physicians trained at the universities, and in breaking into the university circles with their art, if they had not themselves eagerly embraced and mastered the newer anatomical teachings. Only at the larger universities where frequent anatomical demonstrations took place could they do so effectively. But attendance at the universities was expensive, and for social reasons unpleasant for these lay surgeons.

Discussing these conditions at the University of Vienna, Aschbach says: "The practice of surgery was looked upon by the medical faculty at the beginning of the fifteenth century as an artisan's occupation. According to the prejudices of the day the person of the surgeon was marked with a slight taint of inferiority; he was looked upon as a menial assistant to the doctor of medicine, and was classified with the so-called academic citizens, together with the copyist, the book-binder, the beadle. When in 1416 a surgeon applied for an academic degree, and in support of his request set forth that he was experienced in lithotomy and in the operation for hernia, the faculty found the petition not only unusual but insolent, and rejected the petitioner. But surgery gradually achieved a place of honor, and as early as the second half of the fifteenth century (1456), after the introduction of anatomy, the excellent Doctor Johann Krischham called himself Doctor of Surgery, a designation that had not been employed before."

At Vienna a professor of anatomy and surgery was first appointed in 1629; at Leipzig this had occurred in 1531, at Marburg in 1653. At Würzburg surgery was combined with botany and pharmacology in 1587. A professorship of anatomy and surgery was established at Erlangen in 1770, at Innsbruck in 1786, at Kiel in 1794. In general the creation of separate chairs of surgery, usually in combination with anatomy, took place at most of the German universities toward the end of the eighteenth century. Frequently this chair was not counted among the full professorships but occupied a position somewhat apart. Moreover, the lay surgeons long remained in a class separate from the graduate masters of surgery, at the same time retaining the greater part of the surgical practice in their own hands. This condition of affairs continued almost unchanged down to the middle of the nineteenth century, except for the fact that in place of the old guild apprenticeship, or in addition to it, study was required at the universities, or at special schools where only the so-called "inferior surgery" was taught, in contradistinction to the "higher surgery" taught at the universities. Also in place of the guild master's certificate a prescribed state examination was gradually introduced.

Nor did this separation of the lay surgeons in the Middle Ages from their academic colleagues prevent prominent masters of the craft, which was especially appreciated in time of war, from attaining to high honors and distinction at courts and in republics—for example, Ambroise Paré (1517-1590) and Fabricius ab Aquapendente (1537-1619).

In this way the teaching force of the medical faculties had by the end of the last century increased at all the larger universities to four or six professorships, although not all of these positions were considered of equal rank, the teachers of anatomy and surgery frequently having only the rank of adjunct professors or of lecturers.

Chemistry and botany had migrated from the faculty of arts to that of medicine, where they soon began to develop greatly. It is hardly necessary to say that at the founding of the medical faculties in the nineteenth century (Berlin 1809, Breslau 1811, Bonn 1818, Munich 1826, Zurich 1833, Bern 1834, Strassburg 1872) or at the reorganization of much neglected faculties (Dorpat 1802, Halle 1817, Gratz 1863, Innsbruck 1869) special attention was at once given to anatomy, surgery, botany, and chemistry.

One thing more deserves special mention—namely, that until toward the end of the last century and in several of the smaller universities even at the beginning of the nineteenth century, it was taken for granted that every full professor had so completely mastered all the branches of science studied under his faculty, that he could teach any subject of that group without detriment to his students. There was generally a fixed succession of professorships, to each of which were attached not only definite subjects but also a fixed salary. Seniority among the professors usually governed succession; the oldest had the first place, with which was combined not only the highest salary, but often the deanship, and the lion's share of the perquisites. At his death the second professor took over his subjects, his salary and his perquisites. This procedure met with no objection since it was assumed that the title of Doctor of Medicine implied not only knowledge but teaching ability in all fields of medicine. As long as they could, these gentlemen opposed all efforts to increase the number of full professors in the faculty; for, since salaries were small, their chief income was derived from course and examination fees which were paid to the faculty and were divided among the full professors according to statutory provisions.

Such "minor faculties" continued to exist at several German universities even into the last decade, although the number of full professors had in the meantime doubled and trebled, and although all these full professors were, according to recent university statutes, voting members of the faculty in full standing, and of equal rank with the others.

The University and the State.—Before describing the rapid growth of the teaching bodies in the course of this century, it is necessary to touch upon the changed relations of the universities toward the state. As already pointed out, most of the universities founded in the fourteenth and fifteenth centuries were corporations endowed with special privileges and with material means sufficient to guarantee their independence, especially when such funds were supplemented by the students' fees for lectures, disputations, and graduation with the three degrees—Bachelor, Licentiate, and Master. Several of the universities founded in the sixteenth century also enjoyed this liberal constitution.

The government was not at all concerned with the internal arrangements of the universities, even when it granted them annual subsidies and retained the right to appoint several professors, who had been designated by the university as fit for the vacant posts. Thus the knightly Emperor Maximilian I had often supported the University of Vienna with subsidies, and had asked no service in return save "that it flourish and prosper."

In the course of the sixteenth century the governments began to exert a growing influence on the internal affairs of the universities, and several of them, Vienna, for example, became state institutions. It does not lie within the scope of this historical sketch, nor does my equipment suffice to trace the manifold causes underlying these changes which have for all time affected the fate of the universities. I can only indicate that in the first place there were the conflicts in the universities themselves over subject matter and methods of teaching. But there were also the conflicts that arose between the universities and the Roman Church, inasmuch as under the influence of the humanists, the scholastic method of teaching was rudely shaken, and the universities, through the revision of the classics and the introduction of many new pagan authors, were gradually turned aside from their original purpose, which was the service of the church. Then, finally, the idea of a reformation of the church had taken firm hold, especially in the faculties of arts, which still remained the chief element of the universities. When the reformation actually took place, and was followed by the Thirty Years' War, the universities in the various German states were compelled to take a definite attitude toward the church, and to declare either in its favor or for the state. Many external conditions affected the outcome. Wars and religious turmoil loosened the bonds that had united the universities; financial subsidies derived from the foundations assigned to them were often not forthcoming for years, nor had the state money to meet its obligations.

Because of the warlike times, the students had become unruly, their habits coarse, and discipline lax. The universities as scientific corporations could not remedy these conditions. Only the church could maintain discipline in its orders and monasteries. Only under its protection, within the walls of the monasteries and the bounds prescribed by the church, could any peaceful study be pursued in those days. It is easy to see why under these barbarous conditions the state finally lacked trained officials, lawyers, and physicians. The state therefore took the reorganization of the universities into its own hands, and even though their corporate rights and privileges were thereby practically annulled, it cannot be denied that the step had salutary results in the restoration of regular study. For without new and assured endowments and subsidies, the university corporations alone would not have been in a position to reconstitute and carry forward their courses of study in a manner commensurate with the increasing expansion of the various disciplines. The only sources of income to which they might still have had recourse, namely, increased tuition and graduation fees, as well as the payments demanded for public service in law and for medicine, had long since been exhausted because of the chronic poverty of the universities. The high fees kept many from studying, while the increased charges for public service had led to numerous quarrels with the townsmen of the university cities.

The universities founded in the second half of the sixteenth and in the seventeenth century had, even at the time of their foundation, a definitely sectarian character; they were either Protestant or Catholic. Vestiges of this remained at many German universities until within recent years. At Vienna in 1546 no professor could be appointed who had not first shown in an examination before the faculty of theology that he was a good Catholic. In 1554 this rule was moderated by requiring the new professor simply to declare that he was a good Catholic. Then a distinction began to be made between "Catholic" and "Roman Catholic." Several years later liberalism went so far as to allow Protestants to become deans, and one Protestant even became rector. In 1551 the Jesuits established themselves at Vienna, founded schools and obtained the right to fill two professorships in the theological faculty. They gradually increased their influence, until in 1574 they obtained control of five professorial chairs and in 1622 of the entire theological and arts faculties.

They now had the entire university in their hands, with a rector of their own, beside whom the university rector played a minor rôle. As early as 1581 they had established a rule requiring students and teachers to swear adherence to the Catholic confession of faith. The secular element of the university population was thus effectively relegated to the background and stripped of its influence in university affairs, being in constant though impotent opposition to the Jesuits.

This explains, too, why at Vienna the natural sciences, medicine, and law, although they were not directly opposed by the Church, declined at this time to the level of stunted, mechanical, vocational studies, whereas at other universities, especially at the Protestant universities of North Germany, Holland, and England, these sciences began to flourish mightily.

After the reform of the university by Ferdinand I in 1554, the number of medical professors was fixed at three. The first of these lectured on practical medicine,—one year on the entire field of special pathology, the next on fevers. The second was to lecture on the so-called theory of medicine; one year on the aphorisms of Hippocrates, the next on the writings of Galen. The third was to teach the preparatory subjects. The first professor had a salary of 150 florins, the others 120 florins, each one being expected to lecture 4 or 5 hours per week. There were, then, on the average, two or three hours devoted to lectures each day. One of these professors was to conduct the anatomical demonstrations, should occasion arise. A teacher of surgery, not a member of the faculty, was also temporarily appointed.

In 1629 the number of professors was increased to five, with practice, theory, botany, the institutes, anatomy, and surgery as their subjects. The salaries were raised, at least on paper, to 170 florins, even to 1,000 florins. The method of instruction remained the same as before, but through the superintendent, who was an administrative officer somewhat like a trustee, the state prescribed precisely what was to be taught, and from what books. All new matter was officially censored by the rector and the theological faculty. This constituted the most serious infringement of the old faculty rights on the part of the state. It meant the destruction of academic freedom, which was not restored at Vienna until 1849.

Meager as all this was, the course of studies might have continued with a certain regularity if the state had met its obligations toward the professors. But the government ordered that the salaries be paid out of the income from the old endowment fund of the university, and this amounted to a mere 1,974 florins for the entire university. The professors were to increase their receipts by attracting large numbers of students, from whom the faculties took tuition fees which were divided among the professors, and by granting as many degrees as possible. But on account of political and religious conditions, the interchange of students among the universities became increasingly difficult; the degrees of Bachelor and Licentiate in Medicine gradually fell into disuse, and as a result the granting of degrees did not yield much. By 1563 the state subsidy of the university was raised to 3,000 or 4,000 florins, but this was an empty promise. In reality the salaries were often not paid at all for several years.

Since the professors were then entirely dependent on their practice, and lectured very irregularly, government control could not be very rigorous. Probably the superintendent himself did not always receive his salary. The shortage of money was, in fact, so serious that a plan was considered to remove the university to a smaller, cheaper place, to the Vienna "Neustadt," which, however, came to naught, just as did the reorganization plans under Charles VI. The entire university, in so far as it was not in the hands of the Jesuits, sank to the lowest level, the medical faculty in particular being reduced to a shadowy if not a fictitious existence.

Gerhard van Swieten.—The period of depression continued until the great Empress Maria Theresa called Gerhard van Swieten from Holland to Vienna in 1745. Meanwhile momentous things had happened in the medical world. Galileo, Newton, and Euler had revolutionized physics; Robert Boyle and Johann Kunkel, among others, had begun to raise chemistry from the art of transmuting base metals into gold to a natural science. Anatomy had gradually been rounded out into a new science by Marcello Malpighi, Borelli, Thomas Willis, Morgagni; Leuwenhoeck and Swammerdam had already begun to examine body tissues under the microscope. William Harvey, Caspar Aselli, Valsalva and Haller had broken the path for a new physiology; surgery had developed enormously under Richard Wiseman, Rau, Fabricius von Aquapendente and Fabry von Hilden. But above all, Franz Deleboe Sylvius, Sydenham, Hoffman, Stahl, and Boerhaave had sought, though sometimes prematurely, to put the newly explored fields of natural science—anatomy and physiology—at the service of practical medicine. Iatrochemistry had been displaced by the intra-mechanical school, mechanical dynamics by animism, and the attempt was made to get back from these systems to the naïve methods of observation employed by Hippocrates. Needless to say that under the unfortunate conditions described, the medical faculty at Vienna took little note of all these developments; nor could it have taken cognizance of them even if it had had the ability and the desire to do so. Under the existing conditions the medical faculty could not regenerate itself through its own unaided efforts; it had to be raised up by the help of the state; and since there was no one in Austria who could accomplish the task, the necessary assistance had to come from the outside.

The Empress could not have made a more fortunate choice when she called the Dutchman Gerhard van Swieten. The faculty, consisting entirely of graduates of the University of Vienna, naturally did not know how far it had remained behind, and put all sorts of difficulties in the way of the intruder; but the firm loyalty with which Maria Theresa supported her physician, counsellor, and omnipotent director of all medical affairs, made it possible for him to carry through his plans consistently, even though it had to be done with a ruthlessness never before witnessed at the university. The medical school at Vienna owes its world-wide reputation to him, and this reputation has contributed not a little to the restoration of the glory which the university had enjoyed in the first centuries of its existence; it has had no small share in making Austria a cultural center and a great intellectual power.

It is not my purpose to write a history either of medicine in Austria or of the medical faculty at Vienna. I merely wish to point out, using the then generally admired organization of the Vienna medical faculty as an illustration, what a medical faculty of the time could be under the most favorable conditions.

Gerhard van Swieten was an enthusiastic disciple and pupil of Boerhaave; that he himself had great talent as a teacher is evident from the fact that although as a Catholic he was barred from the faculty at Leyden, he had met with great success in that city as a private teacher, and had received a call to London, which he had not, however, accepted. As a writer he is known almost exclusively by his Commentaries on Boerhaave's Aphorisms. At Vienna he at first gave a two years' course in anatomy, physiology, pathology, and materia medica, following Boerhaave's courses and thus laid the scientific foundation for his later administrative activities. Afterwards he lectured only occasionally on the "Institutes."

His statute, organizing the teaching and study of the medical sciences, as well as testing the various medical practitioners (physicians, surgeons, obstetricians, pharmacists), was sanctioned by the Empress in 1749. Toward the faculty it was an act of violence destroying every trace of their corporate rights.

The teachers had almost completely severed relations with the faculty, by which name at that time was meant merely the doctors resident in Vienna; the faculty had a purely formal (and financial) interest in the examinations and graduations.

Van Swieten governed not simply by means of rules and by a precise definition of the task assigned to each teacher, but also through a stern personal check on the execution of all his orders. In so doing, he came into frequent conflict with the Jesuits, and here at times he had to yield somewhat to the wishes of the Empress, although he proceeded mercilessly against all customs, privileges, and at times against individuals. All complaints and representations of the members of the faculty crumbled under his iron will. In order to arrange everything according to his purpose he needed above all else men of the first rank, wherever he might find them, to fill the newly created professorships. So he pushed aside the former professors as old and unfit, and called in new men; DeHaën from Leyden, Jacquin from Leyden, Palucci from Florence, Stork and Stoll from Swabia, Gasser, Crantz, and others. The scientific thoroughness of these men, who trained students to be their successors, put new spirit and energy into the medical school. Although Van Swieten materially increased the number of subjects taught, he knew how to choose professors who could teach more than one subject, and for such men no price was too high. For the foreigners the salaries went as high as 5,000 florins; for the natives only to 2,000 florins. Endowments of 3,000 florins for the botanical gardens and of 800 florins for the chemical laboratory seem enormous for those days. There were, besides, incidental expenses of 900 florins for laboratories, and 1,400 florins for rent for the clinic at the municipal hospital—and all this, not as formerly on paper, but paid in cash. In brief, Van Swieten was allowed to thrust his hand more deeply into the state treasury than a Minister of Education can today.

The following regular courses were at that time given by the medical faculty: natural history, chemistry, botany, dissection, physiology, pathology, materia medica, bedside practice, surgery, and obstetrics. There were in addition special courses for rural surgeons for whom special instruction in anatomy, in practical surgery, and in practice at the bedside were arranged; and, finally, there was special instruction for midwives.

But for all these teaching tasks there were only four or five full professors employed. Chemistry and botany, anatomy, physiology and surgery, and then again surgery and obstetrics, the theory and practice of medicine, were combined over long periods of time and were assigned to a single teacher. The gaps in the curriculum were filled by assistants, demonstrators and special instructors, with whose aid the university was able to keep pace with the increasing scientific demands.

Although few medical faculties in Germany at the end of the last century equalled that of Vienna in its excellent organization and in the accomplishments of its professors after its reorganization by Van Swieten, the conditions described are nevertheless significant examples of the tendencies of the time. Enlightened absolutism flourished, and bore excellent fruit. With firm hand the state assumed the direction of teaching in the academies and universities, certainly with benefit to the general cultural development. It removed these institutions more or less from the influence of the church and at the same time it saved them from complete dissolution in the hands of the old impotent corporations, which obstinately maintained their old forms without being able to inspire those forms with the spirit of the newly awakening sciences. When the state breathed this new spirit into the universities, the old forms were for the most part blown away. That this intervention subsequently did violence to the scientific spirit, when the latter gradually outgrew the obsolescent forms of state-controlled schools, is of such recent occurrence that it need only be mentioned in passing. It was inevitable that absolutism, either in the field of politics or in the school, should attempt to keep the progress of enlightenment within bounds which it deemed safe and useful for itself and for the well-being of the state. Consequently we have reached a point where the universities would like to regain at least a part of their self-government.

The further development of the faculty at Vienna can claim no more of our attention, since it was in later times limited by some peculiarly Austrian conditions, especially by the system of political government. It is necessary only to mention that the system of Gerhard van Swieten was continued under Emperor Joseph II by his son, Gottfried van Swieten (the University Pascha), but on the whole with little success. The forms were the same, to be sure, but the spirit was lacking. Spirit cannot be commandeered, and to create it is not a task that can be accomplished in a few years by any system of rules. Many decades are needed to develop it. The task has the further inconvenient characteristic that it never ends, for when the spirit has been created, it does not fit into the existing forms. Then these must be altered, and so on *ad infinitum.* So the forms of university government, of the faculty regulations and courses of study at the University of Vienna changed frequently, as we shall see later, and received their peculiar local character on the one hand through the struggle of the university with the Catholic Church, and on the other hand through the continuation of the original "Faculty of Doctors" side by side with the "Faculty of Professors." I shall have further occasion to speak of this latter relation.

The changes in teaching methods and in the position of the faculties which have occurred since the end of the last century and which are still in progress can be summed up in general as follows:

In all subjects the demonstration method of instruction has gradually become preponderant. This began with anatomy, and was then extended to practical medicine, surgery, and obstetrics, then to the natural sciences and physiology. Down to the middle of the nineteenth century teachers contented themselves with showing and explaining to the students finished preparations, their chief concern being to convey to them the results of research in the most condensed and systematized form possible. But since the fourth decade of this century the German professor has been pretty generally required not only to know the results of the most recent researches, and to teach these to his students, but himself to be an investigator in the branch of science which he teaches. That combination had been appreciated in the earlier periods also, when happily it chanced to occur; but it is characteristic of the modern spirit of the German universities that they aim to be not only the channels for conveying established knowledge, but also centers of research. They are to unite, to use a popular expression, "school and university" in one. Thus far only the German universities have set themselves this high ideal as their objective; in no other nation is it insisted upon as the most essential trait in the true character of a university.

As a result the teacher has been expected to initiate the student in the spirit and method of research, at least to the point where he gains a practical understanding of the growth and development of the several branches of natural science and of practical medicine, and is able not only by his own investigations to test and corroborate all that he learns, but also to carry on independent research work by modern scientific methods. The increased demands on the teachers logically resulted in a higher degree of subdivision and specialization in the subjects taught; for, assuming that only the investigator can be an excellent teacher, it was necessary to increase the number of teachers. On the other hand, the material taught should not be transmitted to the student with dogmatic finality; he should learn what are its weak points, and how these may be approached and fortified through research. All this demands considerable preparation on the part of the student, and much more time than formerly, if he is not to be thrust into practice without a firm grasp of his subject. In every way, then, the German nation is making increasingly high demands on itself; it is inherent in the idealism that pervades the nation, that its striving for knowledge should be ceaseless, regardless of consequences, and intolerant of final dogmas.

The tasks which the German universities have set themselves and by which they are distinguished from the professional schools of other peoples—which on principle teach only what can be turned to a practical use—are quite extraordinary, and never quite attainable; they presuppose an amount and a quality of preparation such as is not too widespread even in Germany. A conflict with practical requirements is unavoidable. Science must inevitably from time to time enter into new compromises with the realities of things as they are, while these tentative solutions are subject to slower or more rapid changes according to the slow or rapid progress of research. This has its serious drawbacks, but it cannot be altered. It is the duty of the state to furnish the people with well-trained physicians, judges, and teachers in sufficient numbers. The universities cannot evade this responsibility; they must not neglect the school for the benefit of the university. But it is from the university that the school must derive that consuming desire for truth which shall foster the spirit of endless research and of unceasing labor. The task is difficult, but not too great for German energy.

Development of Clinical Instruction.—It is now my task to show in greater detail how in the course of this century the medical faculties developed in the direction of that completeness and point of view which even today remains for them an ideal rather than a perfect attainment.

After the introduction of anatomical demonstrations, which at first made headway very slowly in the medical faculties, depending on the available material, the most important event was the introduction of practical instruction at the bedside, the organization of clinics. There is, to be sure, considerable evidence that the Bachelors and Licentiates, while functioning in the faculty as tutors or doctors, practised in the hospitals of the university cities under the guidance of experienced physicians. As early as 1554, the doctors in Vienna were required by statute to serve in the hospitals. But until the end of the last century this was a more or less incidental matter, and had nothing to do with the curriculum laid down by the faculties. It probably happened more frequently that the professors of practical medicine permitted their students to take part in their charitable dispensaries, and at many of the smaller universities these polyclinics or ambulatories were the predecessors of the so-called stationary clinics.

It impresses us very strangely to hear that several members of the faculty violently opposed the introduction of systematic bedside instruction. They had grown so accustomed to seeing science only in the form of book-study, lectures and disputations, that in the end these forms were considered the only truly scientific ones. Research and teaching in any other form they refused to recognize as "science" and, therefore, to admit to their faculty halls. Many of the university teachers were probably also afraid of putting their practical knowledge to the test at the bedside in the presence of their students. Teachers at the bedside, the "clinical physicians," could only be trained gradually and at the bedside itself, by eminent practising physicians.

To Vienna belongs the honor of having had the first arrangements for clinical instruction. In this undertaking it was so largely favored by local conditions as well as by governmental provision, that along these lines the other German universities were left far behind by the mighty development of the Austrian Imperial University.

Clinics at Vienna.—The great influence which the development of the medical faculty at Vienna has exerted and still exerts on the splendid organization of clinical study in Germany justifies a somewhat fuller consideration of the matter. The first clinical instruction had come into being in the first half of the last century at Leyden under Boerhaave; thence it was carried to Vienna by Van Swieten. At his orders the university clinic was established at the Municipal Hospital on October 6, 1753, and then for various reasons it was transferred, on October 19, 1776, to the united Spanish National and Holy Trinity Hospital on the Rennweg, where at the same time a surgical clinic was established. In 1784 Emperor Joseph II united these hospitals with the "Great Poorhouse" founded in 1693 by Emperor Leopold I, in the Alser suburb, and gave to this new giant hospital the name "Royal and Imperial General Hospital," with this beautiful inscription over the gate: *Saluti et solatio ægrorum.* At the same time the school for clinical instruction was removed to the hospital, which proved to be an epoch-making event not only for the development of the medical faculty of Vienna, but for the science of medicine in Germany.

De Haën instituted the method of clinical instruction for all of Germany which under Johann Peter Frank was developed with even greater definiteness. In the work of the latter entitled "A Plan for a Clinical School, or the Method of Teaching the Practice of Medicine in a University Hospital" published at Vienna, 1790, being a discussion of a plan to establish a practical medical school at Genoa, we find not only a clear exposition of the basic methods of clinical instruction valid today but also a precise statement of the relationship of the clinic to the hospital as a whole. His requirements in this regard are very high and without any delicacy of consideration for the other hospital physicians. To be sure he demands only ten beds for his clinical instruction, but he insists on the unconditional right of the clinical physician to transfer any case suitable for instruction purposes to the clinical ward, and to remove it again to the general wards, once it has served his purpose.

Clinics and Hospitals.—This relation of the clinics to the hospitals in which they are located continued until quite recently in nearly all the larger university towns in which the university itself did not have its own clinical hospital. In more recent times an effort has been made to reverse this relationship, namely, to turn the larger hospitals of the university towns into academic hospitals, —in other words, to put them under the jurisdiction of the Ministry of Education, and to make contracts with municipalities, trade unions and fraternal organizations, relative to the reception of their sick in these university hospitals. Such efforts are based in part on the repugnance felt by every clinical investigator against taking an interesting case away from a colleague and returning it to him only when it offers less of scientific interest, and again on the fact that it seems inhuman to us to use the patients so openly as demonstration material, dragging them back and forth about the hospital.

Clinical Instruction.—But there is a deeper reason for the change in the method of instruction. As I have already pointed out above, instruction at the bedside was in the beginning purely demonstrational: the student was to observe the important disease symptoms in the living patient, so that he might the better remember them. For both teacher and student the patient was simply an anatomical preparation, or like a mineral taken out of a collection for demonstration, or a plant taken from the herbarium. Above all else the symptoms of disease and the therapy indicated were to be taught; the patient served only as a stimulus and aid to the student's memory. In the course of the last decades this has changed. Modern medicine is built on a much broader basis; it demands a careful objective examination of the patient for the establishment of an anatomical diagnosis, which together with the symptomatic diagnosis and etiology creates a concept of a progressive and variously modified disease process. Only by a combination of all these data do we arrive at a method of treatment which is designed to attack not merely the symptoms, but wherever possible the cause of the process, the disease itself, as well as the disease products. To give instruction on a large number of cases it is sufficient to have a moderate number of ambulatory patients at the disposal of the clinics. In smaller cities, where there are few in the classes, the teacher or the assistant and his students may even visit the patients in their homes (polyclinic); but this is not always sufficient, and in the larger cities, where there are many students, it is impracticable. The hasty diagnoses and prescriptions in a dispensary furnish the student an opportunity to develop a certain skill in diagnosis and to learn how to make rapid examinations. But this medical routine, which greatly impresses the public and at first the student as well, is only of relative value, and, as the student is sure to learn later, has little worth as scientific training, even though it may make the task of the young doctor easier at the beginning of his practice. Most doctors learn routine all too quickly in the course of their practice; he who begins to acquire it as a student becomes so accustomed to superficial examination, superficial thinking and superficial treatment, that he is easily spoiled for all serious and penetrative research into a diseased condition. Any quick-thinking person can acquire routine easily and rapidly if he so desires, whereas most persons must be painstakingly trained to careful, meditative, searching thought on the more difficult processes. Thus it is that modern clinical instruction, which is intended to teach how to diagnose a diseased condition, how to observe its course, how, when and at what point it is to be therapeutically attacked, demands a greater wealth of clinical material in the form of bed-patients. The more so since the technic of diagnostic examination is not simply to be demonstrated, but is to be learned by the students and to be practised by them until they can apply it independently.

Growth of the Clinics.—We began by pointing out that at the end of the last century the method of practical instruction was introduced and developed, at first at Vienna by Van Swieten, De Haën and Johann Peter Frank. Soon the other universities of Germany followed suit. On this point I have not been able to obtain precise information from all German universities. Many of them began with a dispensary supported by the state, and a polyclinic (e.g., Würzburg in 1729, Erlangen in 1779, Greifswald in 1794). At others the number of beds was at first so small that they can hardly be spoken of as clinics. For Göttingen 1780 is given as the date of the founding of the stationary clinics; for Prague it is 1781, for Kiel 1788, for Leipzig 1798, for Marburg 1806, for Erlangen 1823, for Würzburg 1824, for Greifswald 1825.

It is even more difficult to determine when a separate surgical, ophthalmological and obstetrical clinic was founded. Maternity hospitals founded by the state, at which midwives were trained, existed as early as the beginning of the last century in most civilized countries, long before obstetrical clinics were thought of. Operative obstetrics even until the forties of this century was looked upon as a part of surgery.

The first stationary clinics were uniformly under the direction of physicians. Until the beginning of this century the patients in all hospitals were treated only by a doctor of medicine, surgical patients as well as the others. The hospital or "municipal" surgeon functioned only as a sort of animate instrument in the hand of the doctor of medicine. Even when the title of Doctor of Surgery was granted, the practical ability of these doctors was still highly doubtful. That Albrecht von Haller (1708-1777) lectured on surgery at Bern for many years without over having touched a human being with a knife, is now scarcely conceivable. At Greifswald from 1825-1829 clinical medicine, surgery, ophthalmology and obstetrics were combined in one professorship and were taught by one man; at Rostock this was the case until 1848. It is scarcely fifty years since surgery was recognized in Germany as a department of medical science on a par with internal medicine itself.

Medico-surgical schools for municipal and rural surgeons were established at Vienna by Van Swieten, parallel to and outside the medical faculties. A medical clinic for the faculty curriculum was established, in which the instruction was in Latin until 1847, when Skoda took office. Since 1784 both clinics have been located in the General Hospital. At the beginning they were conducted by the same professor, later by different professors. This is the origin of the two medical clinics at Vienna, both of which became university clinics with equal rights in 1849, when the medico-surgical school at Vienna was closed.

Surgical Clinics.—The surgical clinic at Vienna was founded in 1776, as mentioned above, but only the students of the surgeons' school were obliged to visit this clinic, not the students of the faculty. Not until 1842 did the head surgeon at the General Hospital, Franz Schuh, receive permission to conduct clinics for students, in addition to the existing surgical clinic for lay surgeons (Von Wattman). Out of this the second surgical clinic developed. Both surgical clinics have been university clinics in the strict sense of the term only since 1849.

Obstetrics.—Instruction in practical obstetrics for midwives and obstetricians was, according to the Almanac of the University of Vienna, given at the General Hospital as early as 1784. The midwives were taught by Zeller; the surgeons by the director of the surgical clinic, Steidele. The latter subsequently gave up the surgical clinics to Kern and later the instruction in obstetrics to

Boër. In 1805 he appears in the faculty of professors as a full professor of obstetrics. Until 1849 attendance at the obstetrical clinic was not required for the attainment of the degree of Doctor of Medicine and the right to practise. The practice of surgical obstetrics was mainly in the hands of the lay surgeons.

Since 1849 an obstetrical clinic has been incorporated in the course of study. There was besides a second obstetrical clinic for midwives, which was not open to students and lay surgeons. Not until 1873 was a second obstetrical university clinic founded. The clinic for midwives continues to exist beside these two, and its director is likewise a full professor in the faculty.

At most of the German universities obstetrics remained a part of surgery down to the second and third decades of this century. In some places this has been the case until very recently. At Prague the separation of the two subjects took place at the end of the last century; at Würzburg in 1790, at Göttingen in 1803, at Kiel and Marburg in 1805, at Leipzig in 1810, at Heidelberg in 1814, at Dorpat in 1820, at Freiburg in 1829, at Giessen in 1833, at Tübingen in 1847, at Rostock in 1848, at Basel in 1868. The universities founded in the nineteenth century had professorships in obstetrics and obstetrical clinics from the very beginning.

Eye Clinics.—In the same way ophthalmology was until quite recently a part of surgery, and was connected with the surgical clinics. Here, too, Vienna was the first to effect the separation, not only by founding a separate clinic, but by making ophthalmology a test subject in the examination for the medical license (1819). Special lectures on ophthalmology were delivered in Vienna toward the end of the last century, usually by the professor of physiology and advanced anatomy, Barth, and his successor Prohaska. In 1813 Beer became adjunct and in 1819 full professor of ophthalmology, at which time the eye clinic became a university institution. Not until 1874 was a second clinic for eye diseases organized in Vienna.

After Vienna, Prague probably had the first eye clinic; then followed Leipzig 1820, Bern 1834, Würzburg 1840, Göttingen 1847. The professorships at this time were seldom for ophthalmology exclusively; as a rule the incumbents were obliged to lecture in other subjects as well. Most of the independent professorships for ophthalmology (at first usually adjunct professorships, but now nearly everywhere full professorships) and their clinics were founded in the course of the last fifteen years under the influence of the tremendous development to which this branch of surgery has attained through the work of Von Arlt, Helmholtz and Von Graefe. In the order of their founding these chairs were: Munich 1859, Zurich 1862, Gratz 1863, Halle 1864, Heidelberg and Berlin 1865, Kiel, Rostock and Bonn 1867, Freiburg and Greifswald 1868, Innsbruck 1869, Marburg and Dorpat 1871, Strassburg and Basel 1872, Erlangen 1873.

Ear Clinics.—A university clinic for diseases of the ear was established at Vienna in 1873, the subject having been taught by lecturers (Gulz, Gruber, A. Politzer) since 1846, and greatly advanced through their efforts.

After the method of examining patients suffering from diseases of the thorax by means of percussion and auscultation, first introduced by Auenbrugger in 1761, had been developed by Corvisart, Laënnec, Skoda and Traube, and had finally become indispensable to all physicians, a clinical section for diseases of the thoracic cavity was created for Skoda in 1840, in order that an experienced teacher might always be on hand for practical instruction in this method of examination. The department still exists and since 1847 has been under Kolisko's direction, although most of the courses on auscultation and percussion are given by the assistants at the medical clinics.

Miscellaneous Clinics.—The first lecturer on laryngoscopy, developed by Türck and Czermak at the beginning of the last decade, appeared at Vienna in 1864; and a university clinic for diseases of the larynx was created there in 1869, under the direction of Von Schroeter.

In 1847 the first lectures on skin diseases and syphilis were announced by Hebra in the catalogue of the University of Vienna, being listed as free electives. The university clinics for these subjects were not founded until 1870 (Hebra, Von Sigmund).

Von Feuchtersleben was the first to lecture on mental diseases at Vienna in 1844. There was no psychiatric clinic there until 1872 (Meynert), nine years after one had been created at Zurich by Griesinger, who exerted so great an influence on the development of psychiatry in Germany. There has been a psychiatric clinic at Berlin since 1865, at Göttingen since 1867, at Basel since 1873, and at Leipzig since 1874.

To round out this account of clinical instruction at Vienna, it must be stated that the attending physicians of all hospitals (the General Hospital, the Children's Hospital, Wiedner Hospital, Rudolf Hospital) who are lecturers or adjunct professors may easily obtain the privilege of giving clinical instruction in their departments and that they make frequent use of this right, sometimes with extraordinary success. A large number of lecturers and clinical assistants give practical courses in a great variety of special branches of practical medicine at the clinical and other divisions of the hospital. Since nearly all the opportunities for bedside teaching have now been united under one roof, and since there is an unusual supply of good teachers among the Viennese lecturers, it is clear that neither London, nor Paris, nor Berlin can compete with Vienna in this respect. The stream of young physicians from all over the world not only continues but is constantly increasing. That such brilliant qualities of a medical faculty should cast some shadows as well, would seem to be inevitable; we shall have opportunity to illuminate these also in another place.

Pathological Anatomy.—Closely allied to the development of the clinics is the growth in importance of pathological anatomy during this century, partly through the efforts of the clinical physicians, and partly through the work of the anatomists themselves.

The dissection of bodies was of rare occurrence even to the end of the eighteenth century. It took almost four centuries to accustom people to the thought that there is nothing terrible and nothing sacrilegious in examining the dead body as one might a piece of mechanism, to find the reason for the breakdown. The specialized classical literature of pathological anatomy begins, as is well known, with Morgagni's book [1] which appeared first in Venice in 1761. The title itself indicates that anatomy claimed the credit for having discovered the seat and the causes of disease. That this is true only up to a certain point, and in the very nature of pure anatomy true only to a limited degree, and that through anatomy alone the seat and the cause of life cannot be found, is now known both to physicians and physiologists. Morgagni, Lieutaud, Sandifort, Baillie, Joh. Fr. Meckel, Vetter, Voigtel, Otto, Cruveilhier and Wagner, and finally Rokitansky, accomplished all that anatomists could do in exploring and arranging the new material in this field. All these men were essentially anatomists, although some of them were at the same time practical physicians. The collections founded by them contained chiefly curiosities and monstrosities, and as a rule formed part of the usual anatomical exhibits.

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[1] "De sedibus et causis morborum per anatomen indagatis libri quinque."

Pathological anatomy, in so far as it was separately dealt with, was taught by anatomists. The new material became vitalized only when the clinical physicians took hold of it and either themselves undertook the dissections or had them performed under their direction. To the symptomatic and etiological concepts of disease were now added anatomical concepts which in part rounded out the old, and in part opened up entirely new vistas. In this way pathological anatomy developed from a collection of curiosities and monstrosities into an important part of medicine. Broussais, Corvisart, Bayle, Laënnec, Louis, Schönlein, Skoda, Oppolzer, Dupuytren and Astley Cooper were the men who began to formulate the relations of pathological anatomy to clinical medicine on the lines along which they are now developing. From the anatomical standpoint Rokitansky sought to meet his colleagues Skoda, Schuh and Oppolzer halfway in this more clinical direction. In Froriep, Reinhard and Meckel von Hemsbach this tendency began to develop further, until in Virchow it reached a perfection and maturity which in its fruitfulness is reminiscent of the most important and brilliant epochs in the history of science.

Although the material available at the General Hospital at Vienna for observing disease and making dissections was of great importance to the early development of pathological anatomy at the university, the achievements of those men must not be undervalued who scientifically exploited this material and early recognized the future and the importance of this young branch of medical science. Not only was pathological anatomy first taught scientifically and extensively at Vienna, but it was here first taught as an independent subject, with a separate professorship. By introducing it into the examination for the medical degree it was made obligatory for all students.

In 1819 the first lectures on "Pathological Anatomy, with Dissection of Subjects," by Dr. Biermayer, were announced at the General Hospital. Dr. Biermayer became adjunct professor in 1823. In 1833 Rokitansky announced his elective courses in the catalogue. He was made adjunct professor in 1834 and full professor in 1845. Since 1839 the position has been a permanent faculty appointment; before that time it had been filled by a new incumbent every four years. Since 1849 pathological anatomy has been an examination subject.

The history of pathological anatomy at several other university hospitals was much like that at Vienna; at first the demonstrations were conducted by the assistants at the clinics, then at the larger hospitals one man, a hospital prosector, was definitely assigned to the task; but the professor of anatomy and physiology (e.g., at Berlin Johannes Müller) might also lecture on pathological anatomy without dissections. Later the prosectors at the hospitals began to give lectures on pathological anatomy, and to open museums, although they were for the most part legally obligated to give all interesting specimens to the anatomical collection of the university.

This transition period lasted about twenty years. Then the teacher of pathological anatomy was made a professor in the faculty. The chair was at first usually an adjunct professorship; it is now everywhere, except at Göttingen, a full professorship. Beginning with the time when the posts were, so to speak, stabilized by the granting of the title of adjunct professor to the young teachers concerned, the establishment of these positions occurred in the following order: Vienna and Prague 1839, Würzburg 1842, Göttingen and Leipzig 1849, Basel and Munich 1850, Kiel 1851, Berlin and Greifswald 1856, Bonn 1857, Freiburg 1860, Erlangen and Marburg 1862, Dorpat and Zurich 1865, Rostock, Bern and Heidelberg 1866, Giessen and Tübingen 1867.

Medicine and Natural Science.—We are now in a position to discuss briefly the relation of the natural sciences to medicine, and to the development of modern physiology in the course of the last three decades.

It has already been mentioned that the writings of Aristotle, which were used as the basis for the teaching of natural science, were expounded and taught at first in the old faculties of arts, and later in the faculties of philosophy. Not until the eighteenth century were chemistry, botany, natural history, zoölogy and occasionally mineralogy and physics taught by the medical faculty. Survivals of this period are still to be found at several universities. But when the natural sciences began to develop so enormously in the course of this century, when chemistry became increasingly more exact, and when it became more closely allied with physics; when the connection between physics, mathematics and astronomy became more intimate, and the points of contact between these sciences and industry became more numerous than their contacts with medicine, there was no longer any room for them in the medical faculty, which after all had to keep within bounds compatible with a medical training. The descriptive sciences similarly outgrew their bounds in the course of the last few decades. Zoölogy pre-empted the field of comparative anatomy, botany a part of general physiology. Zoölogy, botany and mineralogy were greatly attracted by geology and became more closely related to paleontology and anthropology.

Today the natural sciences have deserted the medical faculties, and are back in the fold of the faculty of philosophy. In the meantime the historical and philological sciences have grown to such proportions that the subjects now grouped together in the philosophical faculty have scarcely anything in common beyond the precise and scientific methods of teaching and research with which they are carried on. For this reason it has been urged that the faculty of philosophy should be divided into a faculty of Natural Science, and a faculty of Philology, History and Philosophy. I shall later return to the discussion of this question.

Animal physiology, and especially human physiology, formed from the days of Avicenna to Boerhaave a part of the "Institutes of Medicine" which were prefaced by an encyclopedia of medicine and contained the material that we now classify under the heads of anatomy, physiology, general pathology and general therapeutics. The first member to free itself from this clan was, as has been shown, anatomy. All that is left of the old professorship of the institutes is the present professorship of general pathology and general therapy, attached to which one may still find occasional lectures on the encyclopedia and the history of medicine. Physiology for the most part became the province of the professors of anatomy, but at many universities it was combined with general pathology, or even with zoölogy. In a number of faculties it often alternated among different professors.

When in the fifth and sixth decades of this century histology and embryology made such remarkable strides, a more minute morphology came so much to the fore in the lectures on physiology that the latter was almost completely morphologized.

For the last fifteen years chemistry and physics have again borne the emphasis; today philosophy is once more linking up with physiology, all of which makes the development of this science a fascinating play of constantly changing color and form. The last phases especially have brought about a complete separation of the chairs of physiology and anatomy, for the teacher of modern physiology needs a very different sort of preparation from that of his predecessor of even fifteen years ago. A number of professors who formerly taught both anatomy and physiology had no inclination, or did not feel themselves competent, to follow up all these new paths of physiology; so they usually gave up physiology and limited themselves to the ancient and honorable chair of anatomy.

Physiology has made such tremendous progress in so many different directions during the last three decades, and has learned to avail itself of so many new sources of information, that only a few particularly prominent teachers of this science have been able to hold their own as investigators in all its phases.

All sorts of difficulties confront us as we seek to discover the dates when physiology achieved the dignity of separate professorships at the various German universities. The custom of having a professor for physiology alone, who was to lecture on nothing else, seems to have gained foothold only within the last twenty years.

Being unaware of other combinations, I simply asked my colleagues who were kind enough to furnish me with my data, "when physiology was separated from anatomy at their universities," so that their answers refer, of course, only to this question. In Leipzig there was an endowment for a professorship of physiology as early as 1531, which, however, was combined now with one subject and now with another; for instance, until 1865 it was combined with anatomy. At Vienna, Prague and Freiburg (which until 1806 belonged to Austria) there have been professorships for physiology and advanced anatomy since about 1780, to which the teaching of anatomy was attached, being done by a prosector who was not, however, a member of the faculty. This last-named position developed at Vienna into a full professorship of anatomy in 1811, while the original position even to this day has retained the designation "Professor of Physiology and Advanced Anatomy." At Göttingen, Breslau, Dorpat, Marburg and Rostock, there have been professorships of physiology since the beginning of this century; but these teachers were burdened with other subjects besides, such as pathology, medical jurisprudence, etc. The sequence of the establishment of entirely independent, separate professorships of physiology is, to the best of my knowledge, as follows: Halle 1843, Tübingen 1853, Kiel 1857, Berlin and Heidelberg 1858, Bonn 1859, Zurich 1862, Bern and Munich 1863, Leipzig and Würzburg 1865, Greifswald 1868, Basel and Erlangen 1872. Many of these new professorships were for a time adjunct; now all German universities have independent full professorships of physiology, with the single exception of Giessen, where this professorship is still united with the chair of anatomy.

Summary.—Summing up what has so far been discussed, we find that the universities founded from the thirteenth to the fifteenth centuries usually had two or three teachers in their faculties of medicine, who taught and commented on the works of Galen and Avicenna, and who conducted disputations on these works. Although anatomy developed greatly as a science from the fourteenth to the sixteenth century, it has been taught in the modern method, by demonstrations, only since the middle of the last century; it is not much longer since separate professorships for anatomy, usually in combination with physiology, were established within the faculties.

Surgery did not achieve an independent position in the faculties until the seventeenth and eighteenth centuries, and not until the beginning of this century was it generally recognized as an important branch of the science of medicine.

Practical medical instruction has developed since the middle of the eighteenth century. Out of the professorships for practical clinical instruction grew the surgical and obstetrical clinics in the third and fourth decades of this century. In the course of the seventh decade of the present century ophthalmology separated from surgery, and became an independent subject of instruction.

The rapid development of pathological anatomy led to the creation of separate professorships for this subject in the course of the fifth and sixth decades, while at the same time the content of physiology grew to such an extent that this field was severed from anatomy in the course of the sixth and seventh decades and made an independent subject.

In view of the astounding growth of the natural sciences in the course of this century, and of their continuing development, two practical problems confront a Minister of Education: how to provide the means to find enough teachers to keep pace with this enormous expansion of the fields of natural science and of medicine; and secondly, how to provide the people with physicians, when the study of medicine is so enormously expanded and made correspondingly expensive.

These very grave practical questions proceed from the assumption that the medical sciences will continue to grow as hitherto. Desirable as this might seem to every ambitious person, in the light of historical experience there is no great probability of such growth. After such marked progress there usually follows a static period. The students now have much to learn, it is true, which formerly they did not need. On the other hand, a vast amount that used to be memorized has been discarded, so that the bulk of what in a given era a young physician must know increases very slowly after all, and only in relation to the general cultural development of a people. The state has the right to demand that the faculties shall not increase this bulk of knowledge beyond the amount which a young man of average ability can learn in five years. But it is equally important that the state, while providing for the expansion of its universities, should not neglect the improvement of the secondary schools which are preparing students for the university.

PART II

SUBJECT MATTER OF INSTRUCTION

THE PRESENT GERMAN METHOD OF TEACHING THE MEDICAL SCIENCES. ACADEMIC FREEDOM

The Curriculum.—The great expansion of medical science during the last century, as well as the closer interrelation between it and the natural sciences, make it more than ever necessary not only that a more rigid sequence of courses be introduced, but that the content of the lectures be confined to such bounds that in these lectures a well-prepared student may in four or five years' study be able to cover all that he needs for his profession. It is further desirable that these programs of study and these delimitations of the fields of the several courses be, so far as possible, the same at all German universities, so that migration from one university to another at the end of any semester may cause no interruption in the course of study. Against this last suggestion the objection will probably be raised that going about from university to university during the course of study is, to say the least, unnecessary. There is a pedagogic as well as a social side to this question which may be more appropriately discussed in another connection.

Prescribed Curricula.—Against a more consistent arrangement and delimitation of the material some professors argue that it is not necessary to cover the entire subject matter in lectures; that it is sufficient to stimulate the student to pursue his studies independently; the university does not exist to prepare people for a definite profession, calling or trade, but to spread knowledge as such, without regard to practice.

I am a decided opponent of this view, which I consider inapplicable to our present conditions and dangerous to the existence of the universities. But I believe that the teaching bodies should settle this question among themselves, since in any case they are more competent to decide it than any official, whether intelligent or narrow-minded. In the constitutional states the ministers themselves are only the pawns of their parties, and as heads of departments they are often merely figureheads.

Voluntary Regulation.—The requests made from time to time by the state, that the faculties see to it that the courses are conducted in such a way as to meet the practical needs of the students, have until now everywhere sufficed to bring about a certain uniformity of procedure. That this has come about without actual government interference is a significant indication of the healthy, uniform development of science in all German-speaking countries, a sign of its inner unity and its immunity to all political influences.

I have used the announcements of the winter semester of 1873-1874 and of the summer semester of 1874 of all the 28 German universities as a basis for the following surveys.

Since the study of the natural sciences must precede the study of medicine, we must give this our first attention.

The Natural Sciences.—The question is: How are the natural sciences taught at the German universities? Does the method and extent of this instruction meet the needs of the medical student? Is it inadequate, or is it unduly extensive? We cannot, and do not wish to, evade a discussion of several leading questions concerning the relation of the natural sciences to the medical sciences, questions which in the course of the last decades have been much debated. There is, especially among the older members of the medical faculties, particularly in Austria, the more or less openly expressed opinion that the study of the natural sciences (including physiology) is stressed far too much and at the expense of the student's professional medical training; that physicians do not need to be scholars, since their first business is to learn to treat the sick. In this view of the matter, the more general culture a physician gains, the more discontented will he later be in his profession, especially in rural districts; the more it will require to content him, intellectually as well as materially; the more unhappy will he feel in his mean surroundings, among uncultivated people; the more estranged will he be from the common people who have more faith in a man of their own sort. Besides, most of the medical students are not sufficiently gifted to grasp all that the universities now prescribe for them. Their knowledge is therefore a patchwork, instead of being sound, as formerly, at least in practical matters.

Let us stop there! The views just expressed involve so much of the history of civilization and of science that a detailed examination of them will far overstep the bounds of the task we have here set ourselves.

First of all, let me define the position which I have taken toward these criticisms of the modern method of teaching the sciences. The cultured people of all nations must not cease to spread the desire for study and knowledge with all their might, among all classes and in all countries; they must not cease to impose upon themselves and on others increasingly higher intellectual standards; nor must they cease to support the efforts of their governments in this direction. The physician, the lawyer, the school-teacher and the clergyman form the nucleus of popular education. They are, especially in the smaller cities and in the country, the representatives of culture. The people go to them for advice in all their difficulties; from them the people want to learn what they themselves do not and cannot know. To neglect the education of these leaders, to lower their intellectual and scientific standards, to educate them in such a way that the people will regard them as of their own kind,—as just so many more artisans, like the cobblers, tailors and comb-makers,—that, in my judgment, would mean the repression of our whole national cultural development, reprehensible in principle and absolutely immoral, because it would ruin the nation and make it the prey of another long before its natural exhaustion in the course of the centuries.

Culture is always an aristocratic thing. The physician, the school-teacher, the lawyer, the clergyman should be the best men of their village, of their city, of the circles in which they move. In order to be so they must have the super-power that comes with knowledge and skill, and this is acquired only through the hard work of study, and even more through the cultivation of the inner urge to study.

If anyone cares to force these views to their logical conclusion and to add that a higher scientific education demands not inconsiderable financial means, so that only the propertied, well-to-do classes of the population can gain it, and that I am therefore pleading not only for an aristocracy of intellect, but at the same time for a moneyed aristocracy, I shall admit that too. The civilization of a people can flourish only when its accumulation of property has reached a certain level, and is assured; that is a matter of general experience. The same is true of an individual. In addition to talent, money is needed for study, whether the student possesses it, whether he earns it, or whether he receives it from others.

It seems to me, then, that the highest scientific education of the physician is an important question of national culture. For this reason, if for no other, it must be the aim of every enlightened government. That the study of the natural sciences should be part of the scientific training of physicians there can be no doubt, but how much we are to expect in this direction, and whether these demands are to be met in the preparatory schools or at the universities are open questions. I shall touch on the latter, which has recently been so much discussed, at another point in this book. Suffice it to say in this connection that the elements of the natural sciences, without a knowledge of which no one today can claim to be educated, should certainly be taught in the preparatory school. But that is not enough for a medical student.

Chemistry, physics, botany and zoölogy are today so closely interwoven with general physiology, embryology and human physiology, and so closely related to a general understanding of disease processes, that the lectures on physiology would have to include large elements of these sciences if they were to be intelligible to a student possessing no special preparation in them. The lectures on physiology would have to be spread over two or more years; there would be few teachers capable of such a task, and the student would weary of listening so long to a single teacher. Besides, we must not overlook the fact that even a rapid summary of what the natural sciences offer, and an understanding of their main processes, is a matter of such magnitude that a single hearing is not sufficient to enable the student to grasp it all. The motto "Repetition is the parent of learning" is valid here too. Whatever the student learns about the natural sciences at the *Gymnasium* must be expanded and organized into more definite concepts at the universities. Individually these concepts aid us to a certain extent in a purely historical understanding of physiology, while in their combination they take on ever clearer and more independent forms. Similarly the physiological concepts merge into our concepts of disease processes.

The opponents of the modern preparation in the natural sciences say in reply: "This is all very well, but how much of all that he has heard in his scientific and physiological lectures does even the most highly educated physician remember? How much of all that he once knew? Let the best physicians and professors of practical subjects come before the examiners in the natural sciences and physiology, and only the most recent graduates would be capable of satisfying the present requirements."

That may be true; but it is even truer that the men just mentioned would probably be even less capable of passing a graduation examination at any *Gymnasium* with reasonably high standards. Nevertheless it would be a serious mistake to infer from this that we ought to be satisfied with four years of high school (the *tertia* of the *Gymnasium*), with a superficial knowledge of the natural sciences, anatomy and physiology, and then proceed at once with the study of practical medicine because the latter is, after all, to be our life work. To think thus is to forget that a thorough grasp of modern scientific medicine implies a long training of the mind, both rational and imaginative, and that for this there is no better discipline than the subjects taught at the *Gymnasium*, together with the natural sciences. Would it not be ridiculous to assume that in order to train a young man for public office, all we need do is to lead him directly into the field of public administration and politics? Must not soundness in thought and action, self-control, and ever present command of one's knowledge be gained by long practice and experience? Is the sum total of what a man retains in his memory at any given moment a measure of his efficiency? Can a person from the very outset correctly express every thought, and analyze every complicated subject? Every experienced man will have to answer these questions in the negative. He will have to admit that we are more skilled and sure-footed in dealing with a given matter, the more accustomed we have been to dealing with it in the past. What if we do forget much of what we once knew! In learning it we have developed the requisite processes of thinking, and this training is not lost as long as we are possessed of our full mental vigor. It is precisely as with swimming: we never forget how to swim if we once knew how, though we may lose our practice and endurance.

Can there be a better preparatory school for the physician than the study of the natural sciences? I think not! But entirely apart from the fact that the method of observing organic beings and their growth, of observing the animal body in its most minute details and its most delicate functionings, is quite the same as the method of observing a patient, who is simply an organism disturbed in its functions; entirely apart also from the fact that the talent for simple, exact observation is given to only a few, and must be painfully learned by most,—the content of the natural sciences merges so gradually and imperceptibly into anatomy and physiology, and these just as gradually and imperceptibly into pathology, that the natural sciences are not only a school for the powers of observation, but are, in fact, the basis of medicine itself and of the physician's art. I have never met a physician who occupied himself extensively with the natural sciences or with physiology, who regretted it, or who regarded the time spent upon it as wasted. But I have known many, and I am one of them, who have deeply regretted that they did not devote much more time to the natural sciences in the first years of their medical studies.

To this must be added that the progress of the medical sciences finds its source and impetus chiefly in the natural sciences. I need only recall here the discovery of the optical mirror, the laryngeal mirror ,the development of electrotherapy, of pathological histology, experimental pathology and pharmacology. If the uneducated physician takes notice of such progress, he does so by merely superimposing a new concept upon those already in his memory; but it does not lodge in his mind, nor does it arouse any response, because it finds there no responsive chord. He may have the best of intentions to inform himself about it, but he does not know how to go at it. He has never observed nature in her silent, eternal labors. He recognizes only the most obvious phenomena of her disturbed and destructive activity. He knows precisely certain phenomena in his patients, dogmatized by the school-masters and the medical popes; he knows nature as presented by such dogmatists, but he does not know how to observe it himself. Such men, who put everything in well-ordered pigeon-holes in their brains and then look upon everyone who questions the correctness of this arrangement as a superficial, unpractical person, may be happy and contented.

That every man eventually reaches the age that sets a limit upon the acquisition of new knowledge and upon his ambition, the age beyond which he must be content to work with what he knows, to the best of his ability and his conscience, is a natural characteristic of the human organism, which was designed for a short life. But a young physician who begins with this limitation is just as unpleasant a figure as some of our other prematurely aged youths of modern society. To train such inferior men and physicians we need, to be sure, only "inferior medical schools;" we need no universities!

It would be an anachronism in our time, inspired as it is by a beautiful ideal, and aiming at the perfection of knowledge and of skill, if we were to advocate these medieval conditions and reduce the education of our physicians to the teaching of the works of some modern Avicenna. It is a most gratifying sign of the rapid progress of our time that our best text-books become antiquated so quickly.

Although I am certain, therefore, that the study of medicine must begin with an exhaustive training in the natural sciences, there still remains the important question, how far this study is to be extended, and how much time it may fairly demand, without postponing too far the attainment of the ultimate goal, namely, a medical education.

Is the form in which the natural sciences are at present taught at the German universities still suited to the needs of students of medicine? I must answer this in the affirmative; I was pleasantly surprised to discover in reading the university catalogues how nearly uniform is the instruction in this field.

Chemistry.—Chemistry has long been given a place of great importance in the study of medicine. On the one hand, the obvious relation of this science to physiology was always clearly understood; on the other hand, its connection with pharmacy, toxicology, medical jurisprudence and hygiene have long since put the importance of analytical chemistry as a part of the physician's training beyond all doubt. There is, therefore, hardly any disagreement with the opinion that a survey of the whole field of inorganic and organic chemistry can be taught only at the university, not at the *Gymnasium.* Applied chemistry (medical and pharmaceutical chemistry) can only be treated in greater detail after the student has completed a general survey of the whole field of chemistry. For this reason chemistry is taught at all German universities for 5 or 6 hours per week during two semesters; the subject matter is too detailed and complicated to be covered in one semester. At 23 universities inorganic chemistry is taught in the winter semester, and organic chemistry in the summer term. Only at five universities, Basel, Bern, Greifswald, Leipzig, Rostock, is the reverse order followed. At most of the universities it is assumed that the majority of students begin their studies in the fall, by reason of the fact that most of the preparatory schools (in Austria all the *Gymnasien* and *Realschulen*) hold their graduation examinations at the end of the summer. The university year, therefore, begins in the fall.

The free movement of students among the universities would be facilitated if the uniformity in this direction were complete. At the universities of Berlin, Göttingen, Heidelberg and Vienna there is an opportunity to take organic and inorganic chemistry in every semester.

At many universities there are special courses in various branches of medical chemistry under the designations: biochemistry, physiological and pathological chemistry, chemical toxicology, forensic chemistry. Pharmaceutical chemistry is also taught at several universities. It is most commendable that these branches of applied chemistry are taught for the benefit of those who are especially interested in them, and our great universities may well be proud to list these subjects in their announcements. It is quite another matter, however, to require the professors of chemistry at all universities to give special courses of this sort before very small audiences. I am decidedly opposed to this practice, nor do I consider it necessary to make these lectures compulsory, or to regard them as absolutely indispensable to the scientific training of every physician. In the lectures on physiology, medical jurisprudence and pharmacy these phases of chemistry must be discussed, and it is in such courses that chemistry must be treated as thoroughly as may be necessary to enable the student to grasp the subject.

Laboratory Work.—Independent work and experimentation in the laboratories is indispensable for pharmacists, and highly desirable for the physician. It is very important that the physician have at least some idea of the technic of chemical research, and that he be able to prepare the simpler substances himself. Shorter laboratory courses, at least in quantitative analysis, had better be taken together with organic chemistry; at most universities there are laboratories for this purpose.

Physics.—Not quite so indisputable is the necessity of offering the medical student at the university a complete survey course in physics. Certain portions of physics have been included in the

Gymnasium curriculum as being indispensable to everyone who claims to be educated; and many believe that a course in "medical" or "physiological" physics is enough to round out this *Gymnasium* course, in which only those aspects of physics ought to be covered that are closely related to physiology. That is more easily said than done, and the time saved for the student is less than one might think. Taking A. Fick's book "Medical Physics" as a model in point of content and condensation for such a course, we find that it contains 474 pages, very compactly written, and covers molecular physics. mechanics, hydro-molecular physics, sound, heat, electricity and optics, with references throughout to the more complete text-book of physics by Müller-Pouillet. A general knowledge of physics is assumed. Such a course could not be covered in less than two semesters if any lasting results are to be expected, and it must be handled by a physiologist, for the physicist will have a totally different point of view, and will be little interested in what must seem to him the petty application of physical laws to the animal body. One who is accustomed to work in his imagination with the stars, sunlight, and ether waves, to observe the fall of cosmic fragments into the sun, and to calculate the periodicity and the brilliance of comets in terms of thousands of years, will scarcely be able to grow enthusiastic over the mechanics of the human hip-joint, or the breaking-point of the hyaloid membrane.

We must not overburden the teacher of physics with lecture hours. He should not be expected, in addition to his courses in experimental physics for those who are later to be trained as teachers, technicians, engineers, mathematicians and astronomers, to give special courses in physics for medical students; especially since as a university teacher and a research worker he must conduct special lecture and seminar courses in practical physics, in order to prepare other students to be the university teachers of the future.

While it is evidence of the scientific spirit of the German universities that special courses in medical physics are offered by the professors of physics and by physiologists, and that there are enough students for these lectures, I cannot regard such courses as a necessity.

I believe that the closer relation of physics to chemistry within the last decades has convinced those who formerly advocated a narrower limitation of the instruction in these subjects, of the error of their way. As in the case of chemistry, there is in the field of experimental physics complete unanimity of opinion that its subject matter cannot be presented in less than two semester courses of from 4 to 5 hours per week. It does not appear from the announcements whether the courses are everywhere sufficiently alike, so that a student who for any reason wishes to change from one university to another, can do so without loss of time. Most of the programs of study announce "Physics I" and "Physics II," but what these first and second parts contain is seldom explained. Here, too, uniformity would be desirable, and can present no special difficulties.

To require the medical students to take part in the practical work in physical laboratories, so that they may learn to handle the apparatus and instruments, is in my opinion not altogether justified. For after all, the physicist cannot teach them the technic of using the optical mirror, the laryngeal mirror, electrical treatments for paralysis, for neuralgia, for convulsions, or how to apply the pulleys in correcting old dislocations, or the most important principles in the construction of orthopedic apparatus and artificial legs. The dictum attributed to a famous physiologist, that no one can be a cultured physician without a complete knowledge of differential and integral calculus, I quote only as highly original and clever, without being able to vouch for its validity.

The Descriptive Sciences.—We have now reached the study of the so-called descriptive sciences: botany, zoölogy, mineralogy. The relations of botany to medicine are ancient. Even today common folk regard the herb expert and herb collector as a sort of physician, an idea originating in the primitive fancy that the man who communes with nature in solitude, and who seeks her out, is initiated by her, through some special revelation, into the deepest secrets of nature's forces. There is some truth in the belief that solitary meditation upon nature enlightens the observer, hence it is not strange that he should appear to others in a transfigured light. Solitary, meditative observation is the first step in the poetry of research, in the formation of scientific phantasies, the reality of which we then test with the tools of logic, mathematics, physics and chemistry. Our tests will be the more successful the better we have learned to handle these tools. The diseased organism, the patient, must be observed in just this way, thoughtfully, and in a state of mental solitude and meditation. Where is the disturbance? Of what nature is it? What have been its consequences to date? How will it proceed? What can we do to prevent its progress? To render harmless the already accomplished effects of the disturbance? At what point can we attack it? How? When?

Research.—These are questions to which there are no intuitive answers. Observation must be deepened to scientific research, and that means long, hard work. Nature yields her secrets only in return for arduous labor. The method of research, however, of positing the questions and solving the questions posited, is invariably the same, whether we have before us a blooming rose, a diseased grape-vine, a shining beetle, the spleen of a leopard, a bird's feather, the intestines of a pig, the brain of a poet or a philosopher, a sick poodle, or an hysterical princess. Now the most essential task of the study of the descriptive sciences is precisely to convince the student of this fact and to familiarize him with it. Whatever he may learn incidentally of the physician's technic through the study of these subjects is, in my opinion, merely a by-product obtainable with little effort.

Method.—That the instruction in the natural history of the "three kingdoms," as it is conducted in the *Gymnasium,* must be amplified for the medical student there can be no doubt, but in some quarters there is a desire to see this additional material reduced to the so-called "necessary minimum."

Courses.—In the natural sciences courses especially designed for medical students are being called for. A short time ago I was myself of the opinion that it must be possible to organize a course in general natural science which should contain the most important general elements of botany, zoölogy and mineralogy, so that medical students and pharmacists would need in addition only an intensive course in medical herbs. Whether the course mentioned in the catalogues of Bern and Erlangen under the name of "General Natural History" meets the requirements just stated, or whether the term natural history is here used, as at the *Gymnasien,* to mean zoölogy, I cannot say.

The practical difficulties in the way of this plan are evident when we consider who might be qualified to give such a course at a university, in a scientific, stimulating form that will do justice to the present advancement and probable future development of the subject. That a dilettante, elementary-school manner of presentation is undesirable in a university course, goes without saying; nor is it easy to estimate the time limit to which such a course may be reduced without impairing its value. In any case the time saved will not compensate for the deficiency in content of such a general course.

The method of teaching and study of the descriptive sciences has for practical reasons been standardized at almost all German universities. Aside from the medical students, and those who attend these lectures to satisfy a hobby or to keep abreast of the times, we find that students of pharmacy and of veterinary surgery, future school-teachers and professional research workers may be expected to attend the courses. For all these the instruction must begin with a systematic survey of the whole field. The needs of these groups, excepting perhaps those of the botanists, are not so different, after all, as might at first seem to be the case.

At some universities the subject is presented in one semester, giving to it a considerable number of hours; at others it is presented in two semesters, with fewer hours in each term. I shall note these differences presently; but for practical as well as scientific reasons I must at once declare myself in favor of a division of these courses into two semesters. Not only must the concentration of the material in one semester lead to an inordinately heavy program, but the possible omission of one of these courses cannot be made good until the following year, a situation which may prove very inconvenient for the students. Moreover, it seems to me desirable that the attention of the students should be fixed on this field for at least a year, and that even the appearance of a rapid "skimming" of the subject be avoided as far as possible.

Botany.—Botany is generally treated in two separate sections and, except at Vienna, in two separate courses. The general course contains the anatomy, physiology, and ontogeny of plants; the more specialized course gives a synoptic classification, with exemplifications from the main groups. At nearly all German universities the medicinal herbs are used in these exercises, and therefore we find in almost all the catalogues the note: "with special attention to the medicinal herbs," or words to that effect. The almost complete uniformity in this method of treatment indicates that the number of non-medical and non-pharmaceutical students attending these lectures is small. Where such addenda to the courses in botany are absent, a very short course (one or two hours per week and generally open to the public) on medicinal herbs is added.

At fifteen universities, Basel, Dorpat, Freiburg, Giessen, Göttingen, Gratz, Halle, Heidelberg, Innsbruck, Leipzig, Munich, Prague, Strassburg, Würzburg, Zurich, general botany is taught in the winter, the special course in the summer; at five universities, Berlin, Bonn, Greifswald, Kiel, Rostock, the reverse order is followed. At eight universities the entire field is covered in one semester: in the winter at Vienna, in a three-hour course with many special lectures, and in the summer at Bern, Breslau, Erlangen, Jena, Königsberg, Marburg and Tübingen.

It would be highly desirable for every medical student to take part in botanical excursions and to spend some time in a botanical-physiological museum, but it would not be wise to make this a requirement. Anyone who is inclined to do work of this nature will find the time for it. No one should be driven to do it.

Zoölogy.—In zoölogy a general course covering histology and embryology is not necessary for medical students, since these subjects are sure to be covered in the courses on anatomy and physiology. What is needed is a general survey of invertebrates and vertebrates. I believe that the material contained in the courses in comparative anatomy that were formerly so widely given, ought to be included in the course on zoölogy, and that these two subjects, so merged, be spread over two semesters. There is unquestionably a tendency in this direction, and the idea has already been accepted and carried into effect by many teachers. Separate courses in comparative anatomy are so often looked upon by present-day medical students as luxuries that they are hardly attended at all, and yet there is scarcely a subject that is so stimulating and valuable in training the mind of the natural scientist. Teachers of this subject must of course be chosen with especial care, since everything depends on their intellectual personalities. Wherever zoölogy and comparative anatomy are considered as a connected course, it extends over two semesters at all universities.

At eleven universities, Basel, Berlin, Dorpat, Erlangen, Halle, Heidelberg, Marburg, Prague, Strassburg, Vienna and Würzburg, a two-semester course called "Zoölogy" or "Zoölogy, including Comparative Anatomy" is given; at Halle, Prague and Vienna shorter one-term courses in zoölogy for medical students are given in addition. I cannot approve the general adoption of these abbreviated courses.

At ten universities, Freiburg, Gratz, Greifswald, Jena, Innsbruck, Kiel, Leipzig, Munich, Rostock and Zurich, zoölogy is taught in the winter, and comparative anatomy in the summer; at seven universities, Bern, Bonn, Breslau, Giessen, Göttingen, Königsberg and Tübingen, the reverse is the case.

Opportunity for zoötomical exercises and for microscopic observations in zoölogical laboratories ought to be offered at all universities. A large number of new observations are being made in these fields, for the development of which there is not much room in the physiological laboratories.

Mineralogy.—One of the most frequent contentions is that a medical student need not take a course in mineralogy. I am emphatically in favor of such a course; indeed, I am in favor of including geology and a rapid survey of crystallography in the medical curriculum.

Unimportant as the direct relation of these sciences may be to medicine as the science of curing human ailments, they are yet variously related to chemistry and paleontology, fields which we must and should touch upon when we study zoölogy, anthropology and botany. Indeed, a certain amount of geological information is now so generally available in popular articles and lectures, that without such knowledge one can hardly pass for an educated man. But the educated physician ought to know more about these highly interesting phenomena than other people with a good general education, or at least he ought to command a more definite and exact knowledge of these sciences.

Practical necessity has led to a reduction of the alternating courses in geology and mineralogy to 2 or 4 hours in each semester. At Berlin, Vienna and Heidelberg both courses are given in each semester. At Basel, Bern, Bonn, Dorpat, Freiburg, Giessen, Greifswald, Halle, Innsbruck, Leipzig, Marburg, Strassburg, Tübingen, Würzburg, the course in mineralogy is given in the winter, and the course in geology in the summer. The reverse is the case at Breslau, Erlangen, Göttingen, Gratz, Jena, Kiel, Königsberg, Munich, Prague, Rostock and Zurich.

In arranging the curriculum for a medical student it seems to me immaterial what phase of zoölogy, mineralogy or geology, general or special botany he takes first, because I assume that he brings with him from the *Gymnasium* a knowledge of the basic ideas of general natural history. It is desirable that the subjects be arranged with something like uniformity at all German universities, so that the student who migrates from one university to another may not be interrupted too long in completing his course of study.

Logic and Psychology.—When in the winter semester of 1848-1849 I entered the University of Greifswald, there was suggested to me at matriculation a program in which, during the first semester, courses in Latin and Greek authors, as well as in logic and psychology, were recommended. This is now not generally considered necessary; logic and psychology have been removed from the formal examination for candidates for the medical degree (*examen philosophicum*, the last remnant in Germany of the earlier Bachelor of Arts examination). This examination has been limited to the natural sciences, anatomy and physiology, and quite rightly so. Anyone wishing to study philosophy, history and æsthetics on the side, and to hear lectures on these subjects, will find opportunities to do so at every university. There is no connection worth mentioning between the psychology as taught by the philosophers of the old school, and psychiatry. The form of psychology useful to medical students has been almost entirely absorbed by physiology and pathology.

The Institutes.—Nor do I think that the courses on the "Encyclopedia of Medicine," or the "Introduction into the Study of Medicine," which are still given at five or six German universities, will survive. They are the last remains of the introductory chapter of the "Institutes." The modern youth likes these long introductions as little as the modern public likes the long overtures of the modern operas.

History of Medicine.—It is much to be regretted that courses in the history of medicine are becoming less common at German universities, no doubt because of lack both of students and of teachers. At nine universities, Berlin, Breslau, Jena, Innsbruck, Marburg, Munich, Strassburg, Vienna, and Zurich, lectures on the history of medicine are regularly announced; at Bern, Breslau, Göttingen, Gratz, on the history of surgery; at Giessen on the history of obstetrics. Whether all these courses materialize I do not know, but I incline to doubt it. The larger medical faculties ought to make it a point of honor to see to it that lectures on the history of medicine are included in their announcement, but I do not think it necessary to put pressure on the students to take these courses. Their content would go in at one ear and out at the other, unless the student has a bent for historical studies. Even if his interest in historical matters were aroused, it would soon vanish again if it did not find stimulus in the historical treatment of the material presented in other courses. Wherever a sense for genetic research is present, historical interest is likewise present; the two seem to be indissolubly united. All courses ought, as a matter of fact, to be permeated by the historical spirit. That would foster interest not merely in general historical interpretations, but in special historical research, to a greater extent than courses in the history of medicine can ever do. But that the latter courses could by skillful correlation and combination with the history of civilization, both general and national, be made most attractive, I cannot doubt; in fact, I should like to take such a course even now.

Medical Subjects.—Although there have been differences of opinion concerning the necessity and scope of the sciences thus far discussed as preparatory to the study of medicine, this is not generally the case with the purely medical subjects now to be considered. Nevertheless, even in this field conditions change in many ways, inasmuch as subjects which were formerly taught in great detail have shrunk to a few hours per semester, and other subjects that formerly seemed unimportant have developed so that today they take up much space in the curriculum. There are adherents of the older system, as well as those to whom even the modern expansion does not seem sufficient.

It seems to me that the expanded and modified content of the medical course is effectively adapting itself at nearly all German universities to a time limit which for practical reasons cannot at present be extended.

Anatomy.—Until twenty years ago anatomy was taught at nearly all German universities only in the winter term, and physiology only in the summer, both being given by one and the same professor. This arrangement still persists at Giessen. At present descriptive anatomy is generally spread over two semesters; only at Bern, Jena, Königsberg, and Marburg, is descriptive anatomy concentrated in the winter semester alone. Anatomical dissections are announced at most universities only for the winter, since in the summer the bodies are left to the teachers of surgery for their courses in operative surgery. Only at Vienna and Leipzig are there two coordinated full professorships in anatomy, with two separate anatomical laboratories, and a prosector in charge of each. Everywhere else a single professor of anatomy (excepting the professors emeriti) functions alone, with the aid of a prosector, who is a lecturer (Privatdozent) or sometimes an adjunct professor.

At most universities it is customary for the prosector to teach osteology and syndesmology. Histology and embryology are taught, sometimes by the professor of anatomy, and sometimes by the prosector, or the professor of physiology. There is a tendency on the part of the physiologists today to leave these subjects to the anatomists, and to purge physiology completely of morphology, although modern physiology has grown almost entirely out of the more delicate, microscopic study of anatomy. This is a matter to be decided by the anatomists and the physiologists themselves. It is of practical importance only in so far as the physiologist cannot do without a number of microscopes for teaching purposes in his laboratory, while the anatomist who is to teach these subjects, and to permit his students to work in them, must likewise be provided with a supply of microscopes. The use of the same instruments by two professors, their assistants and students is hardly practicable in the long run.

Topographical Anatomy.—For a time much was expected from courses and demonstrations in "topographical" or "surgical anatomy." Such courses are even now regularly announced at Basel, Bern, Breslau, Gratz, Leipzig, Prague, Strassburg, Tübingen, and Vienna. I have never been able to become interested in this method of anatomical teaching. What the surgeon needs he gathers from his operative courses. All anatomy is in its essence a geography of the human body. The teacher of anatomy must keep in mind in all his lectures and demonstrations the development of the plastic imagination of his students; so must the clinical physician when he develops his pathological-anatomical diagnosis at the bedside. The particular relations of certain specific anatomic conditions to specific methods of operating can be properly grasped and demonstrated only by an experienced surgeon. The same thing is true here as in the case of history of medicine. Historical and physiological-anatomical ideas must be so woven into the lectures on practical medicine and surgery, at the bedside, and in the dissecting room, that in the mind of the student it all blends into unified medical concepts.

If instead of taking descriptive anatomy two or three times, and dissecting for several semesters, which ought to be the rule, one prefers to take topographical anatomy, or if by changing the name and form of the course it is possible to awaken new interest in anatomical study, then certainly it is worth while to continue to do so. Surgery and anatomy have many points of contact, but they are not identical; one may be an excellent anatomist, and yet not have one iota of surgical skill.

Physiology.—The courses in physiology are now divided into two semesters at nearly all German universities (with the above-mentioned exception of Giessen), and are assigned four to six hours per week. In all their announcements practical exercises in the physiological laboratories are provided in addition, and these are everywhere more or less popular with the students, a fact which I regard as very encouraging. It is of prime importance for the scientific life of a physician, not merely to gaze at the demonstrations and experiments prepared for the lectures, but at some time to have the opportunity of going behind the scenes and seeing how these things are done, and of trying his own hand at them. Like the beginnings of anatomical dissection, all these things seem so mysterious, so difficult to one who has never tried them, that even a little acquaintance with laboratory technic is of great value. A certain degree of practice is even essential for similar examinations which must later be made in the sick room.

In all these laboratories, just as in the chemical laboratories, short courses are provided for the beginners, while the more experienced use the laboratories whenever they have free time and inclination to do so. These practical exercises are at the same time recitations, and do far more to stimulate home study than the repetition of courses. As a rule the more talented students are here stimulated to research work, the cultivation of which in these laboratories has borne such excellent fruit. No impartial expert will deny that modern physiology is a thoroughly German creation, and that for the present it is making real progress only in Germany.

One thing more I must mention. Recently the opinion has been expressed that the content of physiology has grown to such an extent that it is quite impossible for the average professor to master and to teach it; that physiology must be divided into physiological chemistry, physiological physics, experimental physiology, etc., and must be taught by three or four teachers. I should regret this development in the interests of science, as well as for the sake of the students. A physiologist certainly cannot be expected to be an investigator in all the phases of his science, but to surrender the unity of teaching physiology would tend so to weaken the concept of the unity of co-ordination in all the living processes of the animal body, that one-sided aberrations might easily be encouraged thereby. The teacher of physiology must derive his material from many sources, and must work over what he receives in order to reproduce it; and this demands of him a vigorous, enduring and harmonious activity, as does the representation of any whole university subject. To withdraw entirely from general scientific work and to bury one's self for life in one specialty, leads too easily to one-sidedness and pride. Such a division of physiology among three or four professors would have a confusing effect upon the students, apart entirely from the inevitable lengthening of the course. Moreover, there would seem to be something self-contradictory in the idea of teaching the student a physiology that a single professor cannot grasp in its entirety. We must guard against so exaggerating the academic phase of medical instruction at the university that the training of physicians becomes impossible. Finally, the history of science proves that some of its streams have their periods of flood-tide, and then subside again. Physiology is now at its high-water mark, but it will not remain so forever. Many branches of scientific specialization after a time return to the main current, since they are but loops of the main stream. Others may run dry. Every investigator may reach the end of his intellectual resources in a given direction. He ought then to attack another problem, and in this way, by a change of thinking and of work, keep himself thoroughly sound and vigorous.

I have elsewhere expressed the opinion that a separate chair for medical chemistry is an ornament to any medical faculty, but I do not consider it absolutely necessary at every university.

Pathology.—Let us now consider the subjects which form the transition to instruction in medical art and science itself as taught in the clinics. Here we find, above all, general pathology and pathological anatomy. As long as pathological anatomy confined itself to dissection and the exposition of the changes found in the various organs, the courses in general pathology remained undisputed in their independent importance in the survey of disease-processes. But when, after Virchow, the genetic representation of these changes came strongly to the fore, and when with the help of physiology, histology, embryology and the experimental treatment of pathology, pathological anatomy became the basis of a new pathological physiology, so much of the content of general pathology was absorbed by general pathological anatomy, that as a matter of fact only the subject of fever, of the pulse, and the general etiology of diseases remained. But these divisions were pre-empted by the clinical physicians, who covered them in discussions at the bedside, and in special courses.

In this manner the content of the former courses on general pathology has become dispersed. The lion's share, and the professorships themselves, have been absorbed by pathological anatomy. This has occurred at all German universities except Vienna.

The courses in pathological anatomy extend over an entire year and are called "Pathological Anatomy, Part I, General" and "Part II, Special"; or "General Pathology and General Pathological Anatomy" and "Special Pathological Anatomy"; or "General Pathology" and "Special Pathological Anatomy," both taught by the same professor.

I consider it an important point in connection with these courses, that the student begin with the general treatment. This might entail for him some loss of time, if he should change universities after having outlined and begun a course of study. Upon inquiry on this point I find that at twenty-four universities the general course in pathological anatomy is given in the winter, the special in the summer. At only four, Dorpat, Giessen, Königsberg and Leipzig, is the order reversed.

At nine universities, Basel, Bonn, Göttingen, Gratz, Heidelberg, Innsbruck, Strassburg, Vienna and Zurich, general pathology is still taught apart from pathological anatomy, sometimes by professors, sometimes by lecturers. I have been much interested in seeing this separate professorship maintained at Vienna, so long as pathological anatomy is taught there by only one teacher, who, in view of the enormous mass of special pathological anatomical work that is loaded on him, is incapable of fulfilling his duties as research worker, teacher, prosector of the hospital, and sanitary officer! At the smaller and average universities I believe these subjects might be consolidated.

For modern instruction in pathological anatomy the "demonstration and dissection courses," in which the students themselves dissect and are shown fresh preparations and are instructed in the method of examining them, are essential. Equally important are the practical courses in pathological histology. These must be short, and must be used for the development of technic and of the diagnosis of microscopic objects. Anyone who cares for them will later find time to cultivate these studies, which have contributed so greatly to the rise of modern medicine.

Materia Medica.—The course formerly given under the name of materia medica has now generally been divided into pharmacology, pharmacognosy, prescribing and toxicology. To be sure, it is hard to find enough to do for the professor who teaches this subject alone, since the content of the course has shrunk so much, and, even at that, about half of what is taught might just as well be omitted. The course can give only a short survey of the most important groups of medicinal substances, demonstrate the most essential types, and teach experimentally the effects of the most virulent poisons. This can be done in one three- or four-hour course in one semester, nor should the students be burdened with more hours in this subject. The art of using drugs, their specific prescription, selection and judicious alternation, practice in using the great variety of remedies with similar effects, as the need arises—all this cannot, after all, be learned in the lectures on pharmacognosis; it is learned in the clinics, and through diligent home study of what has been heard there.

A more detailed knowledge of pharmacy may be of value to pharmacists, and to district physicians whose duty it is to inspect pharmacies, just as toxicology is important for a physician in a court of law. In many countries candidates for medical licenses are examined in both subjects; they may therefore be offered to students, especially at the large universities, although their practical value cannot be very great. If we take these subjects seriously, we must deal with many details that belong to the drug-shop and to chemical manufacture rather than to the physician's art, details which, if not constantly used, are quickly forgotten again.

I take it as a matter of course that no university should omit courses in dietetics and balneology, even though they may be attended by only a small number of students.

Special Pathology, Surgery, Obstetrics and Ophthalmology.—We now come to the courses in special pathology, surgery, obstetrics and ophthalmology, which before the introduction of clinical instruction were the basis of medical teaching, whereas today we are beginning to doubt their pertinence to such an extent that here and there they are being stricken from the curriculum. For a long time there has been some uncertainty as to the scope to be given them. Some wished to give a rapid survey of the entire subject matter within one year, while others contended that it was not the purpose of such courses to present the whole material with an even emphasis; that it was only necessary to illustrate by the treatment of several disease processes in each semester, how the material was to be scientifically handled, the completion of the work being left to home study and to the clinic. Teachers and students are taking a waning interest in these lectures, and since they have ceased to be compulsory they are probably merely announced at most universities, but not regularly given, because often there are not enough auditors.

There is the further circumstance that the teaching hours of clinical instructors are crowded with a great number of subsidiary subjects, such as laryngoscopy, electrotherapy, percussion and auscultation, which are very important and for the teaching of which assistants must be trained by the professors. If the clinical wards and dispensaries are large, these special courses may easily fill three or four hours a day, and this in itself constitutes a demand on the clinical instructor far in excess of what is usually expected of a professor. And as a rule he is not more highly paid than a colleague in the faculty of law or philosophy, whose obligations are fully met by giving a six-hour course in each semester. Shall we therefore employ separate professors of special pathology and therapy? In view of the divergence of opinion concerning the importance of such courses, I should hesitate to advise it.

Special Pathology.—The clinical instructors at Vienna were the first to drop the formal lectures on special pathology. This came about as the result of putting the hour for the lecture immediately before the hour for the clinic, and then allowing the two teaching methods to alternate, according to the clinical material that was available. Finally the dividing line between lecture and clinic, and with it the systematic sequence of the lectures, was lost sight of, and for the last thirty years the clinical instructors have simply been announcing a ten-hour course called "Special Pathology and Therapy and Medical Clinic." The same thing happened in surgery, obstetrics, and ophthalmology.

We have now completely abandoned the idea of giving the students a survey of the entire material with which they are later to work as physicians. Formal lectures have in many instances been replaced by various modern methods of examination. Similar developments have gradually taken place at nearly all German universities.

To me it does not seem wise entirely to abandon the systematic courses in special pathology, whose purpose it is to give a survey of the entire field. They would, it is true, have to be given in a form which would make it possible for students to take the complete course before graduation. Unless the students' privilege of migration is to be curtailed, this would be possible only if a general agreement as to the distribution of the subject matter over the different semesters could be reached and adhered to rigidly. I am well aware that the practical possibility of securing such an agreement would be very small indeed, in view of the great divergence of professorial opinion on the subject. Certainly it could not be accomplished without giving offense and arousing opposition in many quarters.

As the chief objection to this plan, it is alleged that the value of such a course is highly problematic, and that there are so many suitable text-books available, that classroom lectures on the subject are unnecessary. I shall not attempt to decide the question whether and how these courses are to be combined with a clinic. The conditions in the clinics of the smaller, as compared with the larger, universities will determine this matter. In my opinion, however, it is the duty of the university as a teaching institution, to provide for the teaching of the entire field of special pathology, and not to leave the student entirely to the resources of home study in this particular subject, which I consider most important for the physician.

Systematic scientific courses are being dropped by the medical faculty to such an extent that it would seem as if all scientific and medical teaching were being resolved into a series of practical demonstrational courses. The students are quite forgetting how to follow a lecture thoughtfully and with strict attention; they will gradually forget how to study with concentration, and will want to cram everything thoughtlessly, for practical uses, and in a purely technical manner. Let us guard against rushing from one extreme to the other in our teaching methods. It is much more convenient, of course, for the teacher merely to conduct clinics and to teach the simple routine of practice by his own example, but I should consider it a great misfortune if teaching were to be reduced to that alone.

Surgery.—The same can be said of the courses in general and special surgery. They are in the process of vanishing; only the courses in operating methods seem to hold their own at most universities. The courses in general surgery contain much that the student has already been taught in general pathological anatomy and in general pathology. While I do not think it a great misfortune if he hears two presentations of the treatment of wounds, of chronic and acute inflammation, and of infections, from two different points of view, there may still be an objection to the repetition of this material from the standpoint of the curriculum as a whole.

If infections and wounds are given the attention they deserve in general pathology (as was formerly not the case) the lectures on general surgery can be materially curtailed. They would then be limited to general remarks on the clinical behavior of the various types of injuries and their after-effects, covering injuries to and diseases of the skin, the muscles, the bones and the joints. It is difficult to give a general survey of these processes in clinical lectures, so that they are best reserved for classroom lectures, in combination with demonstrations of charts, preparations and actual cases. I cannot understand and am not in the least interested in the usual broad general treatment of dislocations and fractures, and methods of operating. My experience gives me no occasion to say anything concerning fractures which cannot be said in a clinic. Dislocations, with the exception of dislocated shoulders, are the rarest surgical cases that I have met; it does not seem to me appropriate to give special lectures on such rarities.

To give special courses in operating for students is also futile. The typical operations are discussed and demonstrated to the students on the cadaver; they also see them in the clinic. To burden them with the theoretical exposition of the technic of different operations seems to me beside the point. A man who has not been assistant in a surgical ward, and has not performed the typical operations dozens of times on the cadaver, until he can do them as well in his sleep as when fully awake, will never be an operator. It is much more important to enlighten the students by systematic lectures on surgery in general as to *when* an operation is necessary, and to discuss in these lectures only the simplest operative manipulations, as well as the technic of emergency operations that must be done quickly for the immediate saving of life. All else had better be left to later special study in surgical wards. It goes without saying that I do not mean to call special courses in operating technic, fractures and dislocations superfluous; I merely think that they are not essential in a curriculum alongside of systematic courses. Where the latter are absent, such lectures are a necessary substitute. Von Langenbeck's courses on operating were among the most brilliant at the medical school of Berlin; but we can expect only the few to be interested in a subject which in its specialized treatment is, after all, beyond the sphere of the average physician.

Military Surgery.—If a surgeon experienced in military surgery wishes to give a course on this subject, the students ought to be grateful for the opportunity, but to include military surgery as a regular subject in the curriculum seems hardly necessary; gun-shot wounds must be discussed in all departments of surgery. Interest in military surgery wanes quickly after every treaty of peace. No modern war breaks out so quickly that it would not be feasible to give special courses in military surgery before the first battles are fought. Courses of this nature would at such a time be received with the most intense and widespread interest.

I need not emphasize the value of special courses on individual branches of surgery, for example, orthopedics, gymnastics, diseases of the urinary organs. But students will rarely find time to take them. They are rather for young physicians who are planning to specialize as surgeons at the larger universities with rich clinical material.

Obstetrics.—Classroom lectures on obstetrics are becoming obsolete at the universities of the German type. Here and there courses on the diseases of women have replaced them or alternate with them.

If the number of births in a clinic is small, there is plenty of time to discuss the whole field of obstetrics and of women's diseases in one semester. If the number of births and of gynecological cases is large, then everything of practical importance can be observed in almost any semester. This can never be said of even the largest medical and surgical clinics.

What is true of obstetrics and gynecology is also true of courses in diseases of the eye; they rarely occur now in the announcements of the universities. Of the special courses in ophthalmology those most frequently given are on the anomalies of refraction.

Miscellaneous.—Where there are no special clinics, short courses on skin diseases and syphilis, on diseases of the ear, on children's diseases and on psychiatry, should be integral parts of the curriculum, since they cannot be included in the courses in special pathology and surgery, and yet every student should have an opportunity to acquire some systematic information about them.

Clinical Instruction.—Our clinical instruction is purely German in form, and it is characteristically German constantly to find fault with it, to alter and improve it. As with most of our public institutions, we are conscious of its strong points, but we do not, like other nations, take any special joy in sunning ourselves in the glow of our achievements. We torture ourselves in the endless striving for constant improvement, in searching out our weaknesses and formulating plans for betterment. Thus our cultural endeavors exhibit, like our politics, an eternal restlessness, an apparent incertitude, and bear, despite all our idealism, a pessimistic stamp which is unintelligible to the French and the Italians and intolerable to the English.

Von Ziemssen's Criticism.—In the most significant article on "Clinical Instruction in Germany" which has appeared recently, Von Ziemssen says: "If the methods of medical and more especially of clinical instruction at German universities enjoy so great a reputation throughout the world that they are frequently set up as the standard in the reform of foreign methods of teaching, the chief reason for this certainly lies in the methodical progress of instruction, in the regular and purposeful steps by which the students progress from the beginning of their studies to independent activity as physicians at the bedsides of the clinics and polyclinics. The emphasis laid in Germany on a thorough practical clinical training following an adequate theoretic preparation is commended everywhere; in fact, the proverbial thoroughness of the Germans is here altogether essential.

"If, however, we examine the matter without prejudice, and as clinical physicians weigh the final result of our clinical instruction as it appears in the state examinations and again in the work of the young physicians in private practice, we cannot close our eyes to the fact that the practical, clinical training of most of our young doctors has not even remotely approached the degree of perfection indispensable to the physician. The method of clinical instruction has not kept pace with the rapid progress of diagnosis and therapy, especially of diagnostic and therapeutic technic. It has fallen behind these, with the result that there are many gaps in the students' equipment—gaps which are filled by some in their practice at the expense of their reputations, by others through scientific journeys, and by many not at all."

It is a very curious fact that here in Germany, where we give the best clinical instruction, which is greatly admired by other nations, we set the least value on the results of our teaching. It is exactly the same with regard to our entire school system. All Europe says that Germany owes her political success in the last decades chiefly to her excellent schools and universities. Even the effectiveness of her splendid armies and their organization is in the main the result of the splendid education of all classes of the population. But any common school teacher, high school teacher, or university teacher will tell you so eloquently of its many faults that the system will appear to have no virtues at all. This is the case in Prussia just as in Austria, and in Austria just as in Bavaria; everywhere, in fact, where Germans congregate.

The reason for this condition, or rather for this mood, lies in the German national character. We are constantly seeking more education than we can pay for. Material possession, our national wealth in general, which is the basis of all cultural development, bears no adequate relation to our culture or to our striving for culture. In comparison with France, Holland, Belgium and England, Germany is a poor country. Most Germans who aspire to an education and who aim at a secure economic position through intellectual training, do this under the most difficult conditions.

The son of a thriving artisan desires to study. He becomes a student with limited means, and in the end an indigent physician. The son of the petty official or lawyer, of the poor professor, schoolteacher, clergyman or doctor might become a well-to-do artisan, but he prefers to wage an often endless struggle for existence, in order to be an educated man like his father, in miserable circumstances. This is not quite the case in other countries. There the profession of medicine is chosen by many more young men of means, whose parents are well aware that a student needs six, eight or ten years to become a well-trained physician. As for the students from the poorer classes, in other countries they usually give up their aspiration to a complete scientific education. In France and England we find beside and below the Doctors of Medicine, a class of practitioners of lower rank—a simple medical trade employed in large measure by the state or the municipalities. These states do not attempt to provide equally well-trained physicians for all the people. They have lower standards for the lower medical functionaries, and for the schools and teachers set aside for their training. They then create by means of a few universities abundantly supported by the state, a medical aristocracy in the doctors of medicine and surgery, attainable only by students of means, because this course lasts longer and the examinations are hard. I doubt if this system is favorable to our general cultural development or whether it would suit us here in Germany.

As conditions are among us now, it is certain that most of our students of medicine have not sufficient means to permit them to study for five years with a care-free mind, to take the examination after sufficient preparation, to travel for half a year or a year, to practise for two years in the different wards of a hospital, and then at last to have sufficient resources with which to face for at least six years more the probable lack of practice. At least 24,000 German marks or 12,000 Austrian gulden are required for this period of over fourteen years. I shall itemize this calculation later.

Anyone who is without these material resources should understand that from the outset he will be plunged into a chaos of discomfort and discontent from which he will seldom completely emerge, and that the memory and effects of these experiences will leave their impress on his mood and his character for life.

To train impecunious and perhaps inadequately gifted and badly prepared young people, who must give five or six lessons a day in order to live, to be thorough physicians in four or five years, is, except in cases of special talent, a task in which even the most distinguished German professors may fail.

It calls for high praise that under such conditions our teachers are doing the very best they can and are constantly studying the conditions in order to render them more favorable for the students. Among such critics few have as clear a right to comment as Von Ziemssen, whose record as a clinical research worker and teacher entitles him to be heard. I have been particularly impressed with his criticisms as to the shortcomings and inadequate results of the instruction, especially since the number of medical students at Erlangen is not so very great, and because I know how closely Von Ziemssen himself is in touch with the practical instruction of his students. In the last sixteen semesters Erlangen has had an average of 88 medical students; with the usual German four-year course there were 22 in each class. If I assume that two classes are at work in the medical clinic and that the clinical years at Erlangen are especially crowded, there must be from 50 to 60 students in the clinic in each semester. For their instruction Von Ziemssen demands the following staff and equipment:

1. A teacher of clinical propædeutics. (At small universities he ought to be an adjunct professor; at large universities, a full professor.) At the former he will use the clinical material and the polyclinic; at larger universities he will have his own hospital division.

He should teach the diagnostic technic of examining patients, and let the students put it into practice. In addition he should undertake the lectures on materia medica.

2. A resident assistant, or interne to teach methods of examining the thoracic cavity, and to supervise the students in practice.

3. Three resident internes, older students, on a six months' appointment, receiving free board, light, heat and some remuneration, to keep the records and to assist in instructing the younger students.

4. An assistant physician for the polyclinic, under the same conditions as the last-mentioned three internes.

5. Four or five workrooms with complete equipment of all the necessary apparatus and instruments.

6. A liberal endowment for the support of these undertakings.

The students are to attend the morning and evening visits in groups so that they may learn to follow and observe all cases carefully.

Von Ziemssen thinks it possible, and for the training of new teachers essential, to put the patients of the clinic at the disposal of lecturers and special professors as teaching material.

The plan is certainly excellent and deserves careful consideration not only because of Von Ziemssen's position among the German clinics, but for its own sake. Similar wishes and proposals have been expressed before.

Medical Clinics.—In most of these the professor in charge is provided with two competent assistants who work under his direction. The students are required to come to the clinic regularly and are divided into groups that can be effectively handled. The professor is provided with one or more workrooms, and at most of the larger clinics there are "sub-physicians" or "sub-assistants" who for a slight remuneration keep the records. Von Ziemssen's new demands are that more workrooms be provided, that four sub-assistants reside in the hospital, and that a preparatory clinic be added to each clinic. All these new demands are in the last analysis demands for money, for with money all the space required could be made available.

Physicians trained in this way, in a clinic in which no student group exceeds fifty, will, if the teachers know their work, be so well and methodically schooled that they can enter practice with more confidence than now. But it will cost the state a great deal to produce such physicians, and it would be a very intelligent parliament indeed, that would not attack the government for increasing the budget for such purpose.

The position of the professor of the preparatory clinic, if he is to use the material also used by the professor of the advanced medical clinic, presents great difficulties. I do not know what would be left for the professor of the medical clinic at a small university to do, if the few available patients had already been examined and used as diagnostic material by the assistant. What are the limits of propædeutics? Is the professor supposed to conduct a clinic for two hours each day, and during that time simply deliver learned lectures, taking everything else for granted? Surely that would be very tiresome both for students and teacher.

Propædeutic Clinics.—So-called propædeutic or preparatory clinics seem to me to be simply additional clinics; only inferior, naturally unambitious assistants could refrain from competing with the professor of the clinic proper, or trying to surpass him if possible. The proposal amounts almost to the condition that formerly existed at Vienna, when that university had a clinic for people's physicians and surgeons and another "clinic for the higher study of medicine." When Von Ziemssen points out how excellent was Traube's preparatory clinic, my own experience fully endorses his opinion. There were about 20 or 30 in the group, and each of us could see and hear distinctly what happened, and made our examinations under Traube's supervision. That his clinic bore the name "preparatory" or "clinical propædeutics" was due to purely accidental, local and personal reasons. It might just as well have been called simply a "medical clinic."

When my contemporaries and I attended this clinical course we had already attended other medical clinics for several semesters, so that for us it was not in any real sense preparatory. We brought with us a thorough understanding of what we needed and were more industrious than usual. That this clinic has had such remarkable results is not due to the fact that it was called preparatory, but to the fact that Traube was the clinical teacher; and to the further fact that the course was not compulsory and did not count toward graduation. It was attended only by medical students and young physicians who could afford and desired to spend time and money on it in order to learn something for use, and not merely, like the great mass, for an examination.

The natural selection governed by the factors of money and ambition, as well as Traube's outstanding teaching ability and drawing power, were the levers by means of which really extraordinary results were reached. From the fact that Traube conducted an excellent preparatory clinic, and that Hyrtl taught an imaginative and interesting topographical anatomy, we are not warranted in deducing that preparatory clinics and topographical anatomy are essential elements in the teaching of medical science. These facts simply mean that Traube and Hyrtl were eminently successful teachers in other than the usual courses.

I have no objection to the preparatory clinic in form or principle, but it must be part of the clinic proper, and must be in the hands of a competent assistant, to whom the professor gives as much liberty in the matter taught and in method as he deems necessary and wise.

The most important point in Von Ziemssen's program I believe to be that in the medical clinic he would emphasize the unity of medical science, not only at the bedside but in the clinical teaching as well. I should like to stress this, not only for the smaller universities, where conditions automatically impose such a unification, but also for the chief clinics of the largest universities. It is certainly commensurate with the task of the great universities to encourage research by opening special clinics and to attract students from the whole civilized world for the study of specialties. It brings to a university that glory and prestige of which its members and the whole country are proud. But this must not be at the expense of the main clinics, in which the student ought to find everything he needs in his later practice; he ought not to be compelled to supplement his medico-clinical studies elsewhere. The cases of throat, lung, brain, spinal and nerve diseases must not be taken from the general medical clinics, in order to supply the special clinics. The student ought not to become accustomed to hearing the professor say every day "You are hoarse? Go to the throat clinic," or "You are coughing? Go to the ward for lung cases!" Such a scattering of medical thought and action is sure to make a very bad impression on the students. They will accustom themselves not to examine and treat every case to the best of their ability, but on the contrary, they will think, "Well, if even the professor can't handle this case, what shall I do later on in my practice?"

Unnecessary Complications.—The conception of actual medical practice which the student carries away with him for future use from the four chief clinics, the medical, surgical, ophthalmological and obstetrical, is, as things stand, confused and complicated enough. It would be a misfortune for the students, if, not of necessity but to suit our convenience, we should complicate it still further. A clinic at which the student does not use the laryngoscope and electrical apparatus, where he does not learn percussion and auscultation, a clinic at which the director and his assistants do not perform the simple microscopic examinations and demonstrate them to the students, is a caricature of a medical clinic. The professor must insist that his assistants not only master the technic of diagnosis and treatment, but that they give courses as well. The student must take away with him the feeling that here the physician does everything that is necessary, and that there is no witchcraft about the matter,—that it simply calls for a certain routine and practice which he *can* and *must* acquire.

By reserving these diagnostic methods for later special courses not connected with the clinics, and for special clinics, all this technical by-play is inflated to an extensiveness which leads to no deeper understanding of the disease-processes, but which completely discourages the naïve and unsuspecting students who enter these courses.

At Vienna, where the special courses and special clinics in question are most highly developed, they are comparatively rarely attended by the students, since these have neither time nor money for such things, and do not need them in their final examinations. The younger and older physicians who enter these clinics with some preparation and critical sense, and who come to Vienna specifically for these courses, cannot praise highly enough the enthusiasm of the teachers, the wealth of the material, its availability and judicious use. Nowhere in the world is there so fortunate a combination of these elements as in the General Hospital at Vienna. But when they fall to talking about the lectures themselves and the scientific content of those specialties, the comment closely approaches "much ado about nothing! All this could have been said in less than half the time." The meager content of the instructor's specialty, and his isolation in it, make him loquacious.

I should not have discussed this point so fully, thereby running the risk myself of being called loquacious on the matter, if I did not see something very seriously awry in this unfortunate tearing apart and scattering of our clinical instruction. Clinical instruction, too, must bear the imprint of scientific, searching, academic teaching, but not at the expense of the teaching of medicine.

Von Ziemssen's program has another phase that seems to me difficult of execution. He believes that the independent professor of the preparatory clinic should use the patients of the clinic proper in his teaching. If the professor of the medical clinic does not need the visiting patients for his classes, but has enough material in the bed-cases, there can be no objection to such an arrangement,—just as there would be no objection if the preparatory teacher wished to visit poor patients in the city with his students. But the use of the same bed-patients for clinical teaching by two professors is scarcely conceivable without conflict. It is a condition calculated to divide the closest friendship. And then consider the patients! First they are examined by the assistant, and the sub-physician, then by the head of the propædeutic clinic and his students, then in the courses, and in the evening there are more visits by the assistants and students. What a veritable hell for a patient in a ward of that sort! Think of a pneumonia case or a typhoid patient used as clinical material until, like a squeezed lemon, he has had the very life diagnosed out of him! And on top of all this Von Ziemssen wants to put the clinical material at the disposal of the adjunct professors and lecturers. Very considerate toward our younger colleagues, I should say, but terrible for the patient. I would rather give up my clinic than create conditions of that sort!

The Surgical Clinic.—The surgical clinic demands even more attention to technical training. It is quite possible to learn all that is essential to surgical practice during the university course, but talent, inclination and steady industry are indispensable. The combination of these qualities is none too frequently found, especially since most of the students think that surgery is not so essential. For the moment practical experience confirms them in this view, for in the country the practice of surgery is still largely in the hands of the older surgeons, barbers, smiths and peasants, the surgical services of a physician often being regarded by the people as less competent, and at any rate less well-paid than those of the "lower surgeons." In the cities surgical practice is, as a rule, concentrated in the hands of one or two men, who by a fortunate accident have had an opportunity to show their surgical skill and have therefore quickly acquired a reputation.

I cannot endorse the assertion sometimes made that the results of the teaching of surgery are even less effective than those of the medical clinics. In surgery the lack of personal technical skill and sureness is simply more glaring. In case of students who are naturally awkward, such skill can be acquired only by dint of much patient practice, for which most of them have neither time nor money. It is in general a false assertion and an unjust slander of the teachers to say that most of the students leave the university without ever having applied a bandage or performed an operation.

Most of my students at Zurich had been trained to the point where I could safely permit them to perform operations on living patients under my direction. At all smaller universities similar conditions prevail, and the diligent student graduates from these into practice with a knowledge of the essential operative manipulations and enough surgical knowledge to enable him to diagnose cases without perpetrating any surgico-therapeutic nonsense. More ought not to be expected of a two-year course in clinical surgery. Anyone who wants to learn and know more will find opportunity to complete his surgical studies in clinics at all larger universities. If he comes every day to both the morning and evening rounds, if he visits the clinic regularly and continues his study of operations in the courses on the cadaver, he will have an opportunity of making himself felt, and if he wishes, to connect himself more closely with one of the larger hospitals. But for this one needs money, and money, and more money,—and time, time, and more time, in addition to talent and indefatigable industry, and beyond all else an invincible love for this work. No one who does not possess all these qualities ought to complain if he does not succeed.

On the whole the surgeons may be satisfied with the success of their teaching, especially in view of the small respect accorded to their branch of the art of healing even at the beginning of this century. The practice of operative surgery, and interest in it among physicians, has increased enormously in Germany and Switzerland as a result of the methods of the modern clinic. Any doubter ought to visit the cantonal medical assemblies at Zurich and Bern and the annual German Congress of Surgeons at Berlin.

Overcrowded Clinics.—It is evident that where the surgical clinics have more than fifty students, and a host of assistants stands between teacher and student; where the director of the clinic does not give the operative courses himself, and most of the students are so poor that they can take the course only once (just before the examination, so that they may forget nothing!)—it is fairly obvious, I say, that under such conditions not every student can be given a practical surgical training.

Advantages of the Small University.—Other methods and aims of teaching will have to be found. In the introduction to each successive edition of my lectures on general surgery, I invariably write: "The smaller universities offer the great advantage that the teacher gets well acquainted with each student, and comes to know what he may safely leave to the skill of each individual. Conditions at the larger clinics unfortunately make this impossible. At the beginning of your clinical studies, therefore, avoid the great universities! Visit these only toward the end of your course, and later when you have already begun to practise, return to them from time to time for a few weeks."

So often is this same thing told the students of medicine and the public in general that one would really think the medical students in their first clinical semesters would prefer the universities with the smallest medical enrollment. But this is not the case. On the contrary, they all want to go where everything is already overcrowded. A large attendance at a course is in itself an incentive to the student to elect it. This is done with full knowledge of the futility and stupidity of such a procedure, and then the governments and the professors are held responsible if under such conditions the technical equipment of the individual student remains faulty. As if laboratories, equipment and staffs could always be easily expanded or reduced, according to the increase or decrease of the attendance.

In a surgical clinic I consider fifty as the normal enrollment that can be handled with success for all diligent students. In such a clinic there should be about sixty beds at the disposal of the teacher, of which, as a rule, only between 40 and 50 should be occupied, so that the sick rooms may be easily emptied and frequently cleaned. As large a dispensary as possible should be provided. There should be, besides, two assistant physicians, four to six subphysicans, spacious workrooms for the director and the assistants, an operating room with a carefully constructed amphitheater, airy rooms, and in the summer term about fifty bodies for operating practice. There should be space for the maintenance and care of animals for experimental purposes. Two hours a day should be devoted to instruction in special clinical surgery. Well-lighted locations for bandages and instruments are needed, but especially should there be such a room for a separate surgical and anatomical museum. How poorly the German universities are equipped in this respect we hardly realize until we stroll through the wonderfully organized collections of the English universities.

Lectures versus Practical Work.—How best to combine lectures with practical work each teacher must decide for himself on the basis of his own individual traits and the material at his disposal. This depends also on the size of the dispensary and its permanence. The assistants must co-operate in the teaching by making their rounds for dressing the wounds of patients at hours convenient to the students, in so far as they cannot be postponed until the hours for the clinic. If the dispensary is large they ought to serve it after the clinical hours or toward the end of that period and in the presence of the students, explaining to them the various cases. Out of such practice a really preparatory surgical clinic might readily develop.

General Surgery.—There should be in addition a short lecture course on general surgery, followed by courses in bandaging and in operating. It is difficult to make hard and fast rules about the latter, since so much depends on the number of bodies at the disposal of the clinic. I think each student should have had at least two courses in operating before taking his examination; one given by an assistant and one by the professor. The latter should then let him perform minor operations on actual patients, under his supervision.

Where there is abundant material for the clinic, it may be very well to have a second teacher for the surgical dispensary and for courses in general surgery, who would teach what Von Ziemssen, Stern, and Ravot include in the term "clinical propædeutics." It seems wrong, however, to set this down as absolutely indispensable for all universities. It might involve too much scattering of insufficient material, so that in the end no laboratory would have enough.

Dispensaries.—The dispensary has a special importance for the surgical clinic, in that the majority of surgical cases which later occur most frequently in the practice of medicine, such as inflammatory conditions of the glands, bones and joints, incipient ulcers, etc., could otherwise hardly be shown to the students, since patients suffering from these ailments seldom go to hospitals, except in the late stages of the disease, when they are completely incapacitated. Many clinical teachers will not let the dispensaries get out of their hands, if only for the reason that they can there select the material for the clinic, besides being able to round out their own experience.

No one who works in surgical science and writes on the subject ever grows tired of seeing new patients the whole day long. Nowhere else can he learn so much as in this book of personal experience; the bulkier it grows, the better. From its contents he forges the intellectual weapons with which he conquers new fields for the salvation of suffering humanity, and with which he earns and maintains his pre-eminence over all his co-workers. If a strong man, supported by assistants of his own training, can and will take upon his own shoulders the entire teaching of surgery, this would be in my opinion the best solution for the smaller and moderate-sized universities, in the interest of unified instruction, concentration of teaching material, and the scientific management of the clinic.

Specialization.—The separation of ophthalmology and the obstetrical clinic from the chair of surgery is a generally accomplished fact. To require the directors of surgical clinics to refer chronic skin diseases, abscesses, burns, and cases of freezing to special clinics for skin diseases, laryngeal and tracheal affections to special clinics for laryngoscopy, the diseases of the female genital organs and the breasts to special gynecological clinics, the diseases of the male genito-urinary system to special clinics for these diseases, the cases for electrical treatment to special clinics for electrotherapy—which is an ideal in the minds of many a younger colleague—would be, in my judgment, a deplorable step backward. Not only those teachers of surgery who have little clinical material at their disposal, but all of us should object, in the interest of a unified medical training of the students.

At the greater universities with large hospitals, as many special clinics may be opened for talented specialists as may be desired. Still, none of these things must be lacking in the general surgical clinic, otherwise the student would be compelled to visit all these special clinics in addition and would have to study for eight or ten years instead of four or five. Moreover, some of us picture the practical success of so broad a plan of instruction in far too glowing colors. The room for knowledge in the average, present-day brain is after all pretty definitely circumscribed.

It is scarcely to be expected that any of the specialties named can satisfactorily occupy a talented man for life. He will soon have played himself out in any one such direction. Could there be anything more insipid than always to mirror throats and swab them, or to inspect, wash and anoint skin diseases? In a surgical clinic there must also be practice in percussion and auscultation, in laryngoscopy, electrotherapy and microscopy; all excretions and secretions must here, too, be examined chemically and microscopically, as far as this is feasible at the bedside, just as in the medical clinic. The student should always have the complete physician before him in the examination and treatment of patients, whether he be the director of a medical, surgical, ophthalmological or obstetrical clinic.

Having dwelt at some length on the successful conduct of medical and surgical clinics I need refer but briefly to the clinics in ophthalmology and obstetrics.

Eye Clinics.—Eye clinics of fair size, with large dispensaries and an attendance of from forty to fifty students, also require two assistants to aid the teacher. The directors of the eye clinics have only seldom undertaken to teach all of ophthalmology in systematic classroom courses. The great frequency of the most important diseases of the eye offers the physician opportunity enough for thorough courses in the clinic. In two semesters of instruction by the professor and his assistants in ophthalmoscopy and the anomalies of refraction, together with his daily clinical hours, the regular and attentive student learns enough to be generally informed and to avoid dangerous errors in his practice. More ought not to be demanded if the whole medical course is to be kept within the bounds of four or five years. Anyone who wishes to extend his knowledge and skill must have enough money, time, talent, and ambition to gain it. There is surely no lack of opportunity for this in Germany, the source of modern ophthalmology.

Obstetrical Clinics.—The didactic value of the obstetrical clinics depends chiefly on the number of available confinements and especially on the size of the university town and the ease with which admission to the maternity hospitals may be obtained. Without gynecology no clinical course in obstetrics extending over several semesters can be made interesting. Rooms for gynecological cases should be put at the disposal of the obstetricians, but without compelling the directors of the medical and surgical clinics to give up their gynecological cases. Such arrangements can easily be made through professional courtesy. The number of assistants will be dependent on the amount of available material and on its distribution, rather than on the number of students.

Polyclinics.—Before discussing the special clinics that have appeared in recent times, we must mention one other institution very important for the teaching of medicine, namely, the polyclinic. This is the original form of clinical instruction, and was at first almost the only form used in German universities. The university provided a certain sum of money to furnish poor people with medicines free of charge. The clinical instructor then received these patients at a fixed hour at his home or in one of the lecture-rooms of the university building, and used them to demonstrate the diseases to the students; he also took the students into the homes of the poor and gave them instruction there.

The great value of this teaching method in introducing the young physician to the actual practice that awaits him, into the misery of real life, into the social difficulties that must be overcome, is too obvious to require discussion.

But it is evident that this form of clinical instruction is practicable only in smaller cities, and even then only at the cost of a great deal of time to the teacher and the students and assistants. The examination and treatment of the patients under such difficult conditions must at best be incomplete, and more of medical routine would be acquired than of scientific medical training, if this method of clinical instruction had remained the only form used. It has already been mentioned that the smaller universities with their inadequate clinical material cannot do without dispensaries, and therefore the directors of the clinics have usually tried to unite the polyclinic with the hospital clinic, and to leave the polyclinic visits to the assistants and to such students as have the desire and the time to accompany them.

It is hard to decide where polyclinics, independent of the hospital clinics, are desirable, since as a matter of fact this depends in large measure on local conditions. Independent polyclinics of this sort exist at Berlin, Freiburg, Kiel, Leipzig, Munich, Prague, Tübingen, Würzburg and Zurich. At times historic or even local and personal considerations may be responsible for the maintenance or the opening of such polyclinics. The necessity of an independent polyclinic at Tübingen and Freiburg is not evident to me, since I know that the hospital clinics do not suffer from such an excess of patients that the polyclinic might not just as well be combined with them.

The director of a polyclinic must be, above all, a skillful, conscientious, all-round physician, for, since in it all sorts of cases occur, a man who is unscrupulous in diagnosis and treatment may easily demoralize the students by leading them to believe that in this clinic they can learn all that they need in order to be physicians. They then begin to find the careful examinations at the hospital clinics very tiresome and unnecessary, and so they learn only the medical trade, not medical art and science. These apparently very practical teaching institutions are not, therefore, without their dangerous and doubtful phases.

A New Experiment.—Of especial and, it seems to me, far-reaching importance is the development of a polyclinic at Vienna, opened by an association of several capable and industrious lecturers a few years ago, representing a new effort which I have welcomed with much enthusiasm. It is impossible for the state to see to it that everyone who has the desire to teach clinical medicine shall have a ward in a hospital at his disposal. There are now at Vienna, aside from adjunct professors and lecturers who are directors of hospital wards or clinics, two adjunct professors and about forty lecturers on practical medicine, most of whom have been for considerable periods assistants in large wards or clinics, and who would all like to be professors at clinics, an ambition which I find quite intelligible and natural. According to Von Ziemssen's view, we ought now to open the hospital wards and clinics to these young men, among whom there are some excellent teachers and thorough physicians, surgeons, obstetricians and ophthalmologists, and let them try their luck as teachers. I have already expressed myself against this plan in the interests of the patients, the assistants, clinical conditions, and the management.

A number of these young men representing different fields have now combined and have organized a sort of clinical association. They give free treatment, and to the poor, free medicine, and without charge visit in their homes those of their patients who do not live too far away. Regular courses for students are developing, and if the efforts of the group do not wane, and the financial support of the enterprise continues, it is to be hoped that an excellent school for teachers and students may come of the experiment. Unfortunately the desire to establish and support such humanitarian institutions is very indifferently developed in Vienna. Were it otherwise, this young institute would be sure to flourish, and would finally lead to the establishment of a hospital. I have not yet given up hope that a few of the many millionaires of Vienna will presently come to the aid of this institute with large resources, as is done almost daily in England and America.

It would be a great triumph of our independent political and social development if such an establishment grew strong of its own efforts and resources. It would have the proud consciousness of being completely independent of the government and the university budget, just as it ought to be the ideal of every free citizen to be as independent of the state as possible.

Unfortunately the directors have approached the Ministry of Education for support, and the latter has of course availed itself gladly of the opportunity to furnish help. The state has thus gained a foothold in this institute, for it is not allowed to give funds without at the same time exercising control over their expenditure. The directors of the university clinics must naturally be opposed to such an institute, because it is their duty to retain for their own classes as much as possible of the clinical material furnished them by the state; there can never be too much material of this sort for teachers and students,—rarely, indeed, is there enough.

While the clinical instructors are bound to offer passive resistance to the young institute, its existence and further development are important economic questions for the physicians of the city, especially for the younger men. For it is clear that not only the poor, but many citizens of moderate means, and even well-to-do people who can well afford to pay a doctor, prefer to get free advice at the polyclinic, the more so because a number of specialists are to be found there whose names are known to the public. The material loss to the physicians of the city may become very considerable, especially if more such clinical associations are organized. In London, where similar conditions have developed, they have led to lively and excited debates in the medical societies.

The authorities can and should put no obstacles in the way. It would be just as reasonable for the architects to complain that the building societies curtail their earnings, or for the individual bankers to urge that joint-stock banks do them great harm.

In the field of medical practice and teaching this development is somewhat new, but it has grown naturally out of existing conditions. If we say of the courageous and energetic founders of this institute, whose leading spirit is the well-known dermatologist, Professor Auspitz, that they are less concerned with teaching than with making themselves known to the public and extending their practice, I cannot see how, even if in a general way it were true, we can reproach these men for it, or why we should cast aspersions on them.

Let us judge the matter objectively and coolly. I am sure that everyone who undertakes to teach in a university clinic, no matter how seriously he takes his teaching work, and no matter how enthusiastic he may be, still has regard to the fact that his position will give him a material advantage in his practice. Indeed, I do not hesitate to confess that in the past I have declined opportunities to become professor of pathological anatomy, and declined them not solely because I had an overwhelming love for surgery, but because I did not feel the strength to undertake the martyrdom of an exclusively classroom professorship, which, by precluding private practice, would not have permitted me to order and live my life in accordance with my standards of comfort. Of course in making such a decision one may easily sit down between two stools, in which case one should not complain.

I can only repeat that as a writer, and not in my capacity as an official of the state, I wish the young institute a vigorous growth in all directions, to the advantage of the poor patients, the teachers and the students. But let it guard against the treacherous gifts of the state; for the state must inevitably become the enemy of such a private institute, the moment the latter comes into competition with the institutions which the state has established and supports.

Special Clinics.—Of all the special clinics, the one for children's diseases seems to me to deserve the most consideration. Its establishment is only a matter of money, for poor sick children are everywhere to be found in large numbers. Here, too, I must insist emphatically that the directors of medical, surgical and eye clinics must never be prevented from receiving sick children of every age, and from using them in their teaching in the dispensaries. On the whole, the inclination to take very young children is not very great among the directors of clinics because of the lack of suitable nurses. It would, however, always be possible at a large university hospital to set aside one or two wards for children exclusively and to have these children treated by one clinical physician or another, depending on the disease from which they may be suffering. Such a system, a trifle complicated, to be sure, existed at one time at Zurich, and in view of the amicable relations among the teachers it proved practicable.

It is also proposed to attach the children's ward to the medical clinic and to put it in charge of an assistant or aide, in order that it may be used in teaching. The most effective form for the teaching of clinical pediatrics must depend at each university on local conditions. Independent children's clinics exist so far only at Basel, Bern, Berlin, Leipzig, Munich, Prague, Vienna. It is, of course, best to conduct these in separate children's hospitals, and the establishment of such hospitals cannot be too strongly urged.

Many young physicians come annually to Vienna to study pediatrics, where a children's hospital has been in existence near the general hospital for several decades. Instruction in this subject would have to be concentrated into two hours for one semester, in order to fit into the students' curriculum.

It is only too true that complete ignorance on the part of the young physician, especially of acute and exanthematic children's diseases, may prove most ruinous at the beginning of his practice. These diseases involve a small number of technical medical points which there is little opportunity to acquire at the medical clinics. Extensive polyclinics can partly but not completely make up this deficiency.

The catalogues of sixteen universities, Basel, Berlin, Bern, Breslau, Erlangen, Göttingen, Greifswald, Jena, Innsbruck, Leipzig, Munich, Prague, Strassburg, Vienna, Würzburg and Zurich, announce a psychiatric clinic, or lectures on psychiatry with exhibition of patients at an insane asylum, which is about the same thing, except that in the latter case the insane asylums are not closely related to the universities as clinical schools, and their directors are not members of the faculty.

Psychiatry.—Whether clinical instruction in psychiatry can be given profitably at a university depends, of course, apart from the need for a competent teacher, on the presence of an insane asylum in the university town. The establishment of small psychiatric wards in the minor academic hospitals seems to me rather futile. There are even today great difficulties in the way of the execution of the idea so warmly championed by Griesinger, that the insane should be kept in hospitals like other sick people, being housed with other nervous cases in a special ward of the hospital. And it would be highly questionable to ask the director of a medical clinic to give up his nerve cases to a special clinic; such a procedure would be wrong in principle.

The lectures on psychiatry in connection with the psychiatric clinic should not occupy more than two hours a week, and must be repeated in each semester in regular rotation, if all the students are to have an opportunity to attend this clinic. The average student will not be able to get more out of it than an approximate survey of the subject matter and especially an idea of its connection with the rest of medicine. Anyone who wants more must occupy himself with the study later, and can find excellent opportunities for doing so at Göttingen, Berlin, Munich and Vienna, while several other universities offer short courses.

Skin Diseases.—Ever since Hebra, Simon, Von Sigmund, Von Baerensprung and Zeissl revolutionized the treatment of skin diseases and syphilis, Vienna and Berlin have quite properly given those subjects an important place in the university courses, and have promoted their eminent exponents to full professorships, much to the gratification of those of us who thought it should have been done long before. But to deduce from these facts that every university ought to have a clinic for skin diseases and that the head of this clinic should be a full professor, is just as foolish as it would be to expect every young dermatological hotspur to be a Hebra. The field of skin diseases still remains narrow and limited; it can awaken scientific interest only when it gains variety through the acquisition of an enormous mass of material for study. In the small rural cities, where the German universities flourish best and yield the best fruits, not enough cases of syphilis or skin disease can be found to maintain a constant scientific interest or furnish profitable clinical demonstrations. Nor can the medical and surgical clinics afford to relinquish this material which they need to round out the presentation of medical practice.

The young physician should certainly become acquainted with these phases of disease, and learn to treat them properly; but it is altogether false to assert, as some do, that a thorough knowledge of skin diseases and syphilis is the most essential and advantageous knowledge a young physician can possess at the beginning of his practice. This is true only for young doctors in large cities, and for military physicians. It is not correct to judge the frequency of syphilis in Germany by the seaports and Berlin, Prague, Munich and Vienna, nor the frequency of interesting skin diseases by their appearance in Galicia, Hungary, South Russia and the Orient, whence Vienna draws its chief contingent of such cases.

Aside from Vienna, where Hebra's reputation gives this subject added importance, the clinics for skin diseases attempted here and there have had little success because the material has been too limited and therefore monotonous. The opening of a clinic for skin troubles and syphilis at Innsbruck is, in my opinion, only a proof that the Austrian Ministry of Education has at its disposal such enormous funds that it can spend a few thousand gulden annually on luxuries. The liberal members of the Reichsrat will hardly be able to suppress a smile when they hear that it is necessary to set up a separate ward for syphilis in little, gentle, pious Innsbruck.

I believe that the busiest physicians in the country and in the small and moderate-sized cities of Germany see hardly more than four or five cases of syphilis or gonorrhea in a year. There is no sense in burdening the budget of the small universities with so many special clinics, which in the nature of things can have neither enough scientific value nor practical success to compensate for the sacrifice. Certain diseases can only be studied in large cities, because they arise out of the social conditions existing in the large centers of population and are spread there. There is no alternative: if the young doctor wishes to know all there is to learn, he must finally go into the large cities; and for this he needs money and more money. Knowledge, too, is a commodity that must be bought.

Diseases of the Ear.—Until very recently instruction in the diseases of the ear was in a very bad state. I remember well from my own student days how the poor deaf people were sent from one clinic to the other; nobody felt inclined to take any interest in them. With a few obvious exceptions this field is therapeutically much too barren. It is worth noting as a new sign of the untiring effort of our present young German medical generation, that talented men are gradually being found who are willing to dig into this difficult and thankless domain, and to teach it. Clinical ear dispensaries exist at Berlin, Bern, Halle, Jena, Leipzig, Vienna and Zurich. So far as I know there is a hospital clinic for diseases of the ear only at Vienna, where it is in the hands of two adjunct professors. It is out of the question to demand clinics of this sort of every university; there would not be material enough. The ophthalmologists at the smaller universities ought to be persuaded to take over otology, no matter how little liking they may have for the subject. It is desirable to give this small and yet not unimportant subject a definite place in the curriculum of the universities.

From all that has been said it is clear that I cannot advocate the establishing of further special clinics, least of all for such specialties as are in essence only a technical development of methods of diagnosis and treatment, such as laryngoscopy and electrotherapy. Even at Vienna in future the laryngoscopic clinic had best be united with the general clinical division for diseases of the lungs. Fortunately the establishment of a clinic for electrotherapy at Vienna has so far been prevented. The technic of electrotherapy cannot claim a scientific significance of such breadth that special wards should be set aside for it. It achieves its proper educational importance only when it is put into the medical clinics and into the hands of one of the clinical assistants.

Public Health.—Public Health is included in the curricula of all universities, and is divided into the fields of medical jurisprudence, public sanitation and hygiene.

From a scientific point of view it would be possible to oppose the claims of all these subjects to be taught at the university, for in teaching them we are not concerned with the investigation of scientific questions outside the sphere of chemistry, anatomy, physiology, pathological anatomy, general pathology and etiology, toxicology, practical medicine, surgery, ophthalmology and obstetrics—sciences that are already represented—but with the application of these sciences to quite definite unfortunate and harmful social conditions. They, like political economy, are still struggling for their separate scientific existence.

But the state, which trains competent physicians at such great sacrifice, has a right to demand that the physicians be not too completely unprepared for the questions it may put to them. A great part of the ills of society, to combat which the help of the doctors is asked, is very old and there is a certain amount of experience to aid us in dealing with them. Certain measures have had some success. The state expects the physicians to be familiar with the most important scientific principles that are applicable and with the technic of their scientific application. The physician, as one of the most important members of the community, is expected not only to help in cases of individual sickness, but in community diseases as well. He is even expected to do his part in curing the stupidity and indifference of humanity. A beautiful task, but one that can be accomplished only by many generations of physicians, and then only imperfectly! Before anyone can become interested in it he must be filled with an almost sentimental enthusiasm for humanity in general. To be sure, these enthusiasts, whom we hold in great esteem, say, "Are not health and long life the first condition for the material well-being of a people, as well as of the individual?" I grant this as far as health is concerned. But in my opinion health depends much more on heredity than on other social conditions.

Long life is a matter of taste. If longevity is to be attained by the renunciation of enjoyment and by frugality in material and intellectual aspirations, most people will decline it with thanks. Everyone knows that life in the great city and too much mental and physical work are harmful, that they wear out the nervous system and make for early old age; but few will on that account shun enjoyment and larger earnings, just as little as the workers avoid the well-paying, dangerous factories, although they know that the less remunerative agricultural labor is more wholesome. "To live a full and swift, even though unhealthful life, and to be speedily destroyed, is better than to live healthily and long and be bored. Overpopulation and increased competition are our worst enemies. It does no harm if epidemics and wars annually take their liberal toll of the population." That is the spirit of our time. The fanatical champions of public health are fighting for a goal that is too high for my myopic vision. I can admire the struggle, but I cannot become interested in it.

Nevertheless, I must concede the justice of the demand that we should strive for the best results that can be achieved under our unalterable social conditions. Rome was always a miasmic swamp, yet this did not prevent an enormous concentration of population there. It sought to save itself from complete destruction by bringing good drinking water in immense quantities from the mountains, and by a magnificent drainage system. All this could not prevent its destruction by the Germans. In like manner, hygiene cannot make nations immortal any more than the most perfect medicine can save the individual finally from dying. So much must be admitted. And I dare say London, Paris, Vienna and Berlin would be well content to be possessed of vitality as tenacious as that of Rome. Virchow at

Berlin, Pettenkofer at Munich, Varentrapp at Frankfurt a. M., Roth at Dresden, Von Mundy, Seegen, Von Karajan and Hoffman at Vienna, have fought valiantly for public hygiene.

As a rule, the professor in question lectures one semester on medical jurisprudence and public sanitation, and the next on hygiene. The advocates of this work are not content with merely listing these courses; they want to compel the students to take them. Hygiene is to be the subject of a new professorship, with much paraphernalia, chemical laboratories, etc., such as Pettenkofer has set up at Munich. If the whole of Social Medicine must needs be part of the curriculum of the medical student, it must not take more than two hours per semester, let us say, during the last two semesters; otherwise it will surely be detrimental to his other studies. This subject will never greatly interest the student, for he will have his hands full in dealing with the diseases of the individual, and will take as little interest in the community welfare as he has in practical politics and diplomacy. These are things for mature men. All that we can ask of the student when leaving the university is that he shall have at least an approximate idea of the meaning of the terms medical jurisprudence, public sanitation and hygiene. At Vienna, where there is much superfluous money for unimportant subjects, we shall doubtless soon have two full professors for each of these three subjects, and for each professor a little laboratory with assistants!

Résumé.—When we consider the subjects treated, the way in which they are distributed over the course, and the methods of instruction, we find that without the intervention of the governments the universities have achieved a truly remarkable degree of uniformity. Allowing for limitation of resources and for local conditions, even the smallest universities have kept pace with the advancement of medical science. There are at the moment differences of opinion concerning the teaching methods in use in several subjects; this is true, for example, of the formal lectures in the field of medical practice, in which new modes of presentation are being sought. We have found that in many universities, if the students are to receive adequate clinical training, many more assistants are needed, and that in order to provide these and the necessary material, there must be increased endowments. Furthermore, in the interest of free interchange of students among the universities, a greater uniformity in the arrangement and distribution of lecture content is desirable, particularly in those subjects which cover a year or more. To bring this about, only a few universities would have to make some minor concessions.

Finally, it appears from the foregoing exposition that further enlargement of the curriculum is not at this moment advisable. It is not good policy further to increase the cost of the study of medicine in view of our characteristically German endeavor to provide our people with uniformly trained physicians, inspired by a love of knowledge and a desire to serve humanity.

The combination of university and school, of investigation and instruction in our universities has proved itself an institution of great national and pedagogical value to Germany; indeed, we may be honestly proud of what the universities have done for our general education and cultural development, and have every reason to honor the institutions that have done us this service. Whether at one moment the academic side preponderates, or at the next the teaching tradition, depends on the variations of current tendencies in the different branches of medical science, as well as on tendencies in the science of medicine as a whole. In this respect the universities, as well as their several faculties, show a certain definite individuality. If I am not mistaken, our medical faculties are just now pretty generally inclined to give greater weight to academic work, hence the cries of the philistines to the effect that practical, sound training, the actual training of the physician, is being neglected, and that too much emphasis is being put on scholarship. Even if this must be granted in certain respects—and it is true that definite methods of instruction have not yet been found for much of the new content given to the natural sciences through the investigations of the last decade—I can see in it no great misfortune, nor any reason for threatening to change the character of our universities. It would surely have been much more regrettable if other nations had surpassed us in scientific research, while we clung to the old cast-iron forms.

General Aspects of the Student's Preparation.—With reference to the study of medicine, I can only repeat that the young doctor can at any time acquire the practical routine of medical work in half a year, provided that he is equipped with a thorough knowledge of his subject. He can acquire a sense for scientific training only during his student days, but unfortunately this newly born scientific spirit is often killed outright by the premature development of medical routine. The degree of scientific training and interest imparted to the young man at the university determines his intellectual level for the rest of his life. It enables him, it even persuades him, to keep in touch with scientific development, and even though the breakers of practical life should for a time carry him away from the green shores of the Promised Land, he will be able, when the sea has subsided, to row himself back again, there to gather refreshment among the newly ripened fruits. In the face of these great, culturally invaluable assets it amounts to a mere bagatelle if a young disciple of Æsculapius, confronted with a case which he has properly diagnosed, cannot at once recall the formula for the prescription he wishes to write, but must look it up in his note-book. That happens even to older practitioners in the case of less frequently prescribed remedies. Any little harm that may come from such slight awkwardness at the beginning of his practice will not be done to his patients, possibly to himself, but he will soon remedy the fault. Much worse are the young physicians who, proud of their practical routine, know it all, recognize all diseases without examination, have by heart half a dozen prescription formulæ for each symptom, and thoughtlessly employ these in the last as well as in the first years of their professional careers; who are immune to all progress in their profession, always convinced of the absolute rightness of their action, and sustained by an exaggerated sense of their own importance. Such young physicians do well at the beginning, especially if they know how to ingratiate themselves with the public. But in the course of years the public will see through them, for it is growing increasingly sensitive to intellectual power, and it soon becomes aware of the fact when it is dealing with mere routinists without real knowledge, with shadows without substance.

We must not deceive ourselves and the governments of the different states as to the amount of actual knowledge, the degree of scientific accomplishment and of technical equipment that can be acquired in four or five years by men of average talent, average energy, and average preparation. We must therefore not set our standards too high. Every professor in conducting his examination ought to remember how he felt when he was sitting before his examiner.

A Proposed Curriculum.—The general distribution of the teaching material over a four- or five-year course follows a natural order. The length of the course of study as well as the so-called required courses will be touched upon under the head of prerequisites for the examinations. At this point I only wish to speak of the purely practical importance of the program of courses which are given to the students at many universities when they matriculate. Such programs are given at the German-Austrian universities, Vienna, Prague, Gratz, Innsbruck, and also at Berlin, Bern, Bonn, Breslau, Dorpat, Greifswald, Halle, Heidelberg, Munich, Strassburg and Zurich. All the courses of study that lie before me fulfill their purpose either not at all, or at least very imperfectly. Only in the announcements of Munich and Dorpat are the hours for the courses and the time they cover stated, thus enabling the student to determine whether a given program is practicable, which in my judgment is the sole purpose of such an announcement. I am altogether of the opinion that the sequence of courses can and should be arranged only by the faculties themselves, taking into account their own peculiar local conditions. Nevertheless, the state has not only the right, but the duty to require each faculty not merely to provide in general for the teaching of the principal subjects, but so to arrange the lectures as to hours and time that the medical student can cover the most essential ground in a logical sequence in four or five years. In other words, the individual members of the faculty must undertake to accommodate themselves to a program of studies arranged by the faculty as a whole and subject to revision perhaps every five years, both in respect to the number of hours which they require for their subjects and the hours of the day when their lectures are to be held.

According to the principles set forth above, the extent of the course, practical exercises and lectures should be regulated about as follows:

Chemistry, a short practical course, six hours per week throughout a year.
Physics, four hours throughout a year.
Zoölogy and Comparative Anatomy, three hours throughout a year.
General and Special (medical) Botany, three hours throughout a year.
Mineralogy and Geology, two hours a year.

Anatomy, with Histology and Dissection, ten hours a year.
Physiology, with brief practical exercises, eight hours a year.
General Pathology and Special Pathological Anatomy, with practical exercises, six hours throughout a year.
Pharmacology, Toxicology and Prescribing, four hours half a year, or two hours a year.
Special Pathology and Medical Clinic, with courses in methods of diagnosis, ten hours throughout two years.
General and Special Surgery, Surgical Clinic, with courses in bandaging and operating, ten hours throughout a year, or five hours half a year.
Obstetrical and Obstetric-Gynecological Clinic, three hours throughout a year.
Eye and Ear Clinic, with a course in methods of examination and operation, four hours throughout a year.
Public Health, four hours throughout half a year, or two hours throughout a year.

I do not mean to say that one or the other of the courses may not be expanded by an hour or two and still be within the limits useful to the student; but in general the arrangement here made meets the time requirements for the different subjects, and represents what is attainable in the four- or five-year course. In the first half of his course the student ought not have more than twenty to twenty-five hours of lecture and laboratory work. In the second half, when the practical work predominates, he can handle thirty to thirty-five hours. If the hours are arranged without time-killing intermissions, there will still be time for the student of average ability and industry to take secondary subjects.

Of course, the medical student must always remember that his student days are the most serious and difficult of his life. He will not have time, outside of vacations, for jollifications, recreation and enjoyment. The student of medicine must understand that he cannot have what is commonly called a good time during his university days. He must postpone all that to later years, when he is an old physician with a comfortable practice; in fact, most physicians must do without it forever. Everyone who enters this career ought to consider these things, lest bitter disappointment await him.

Natural and necessary as it seems to me for the faculties to make certain concessions for the sake of a definitely outlined course of study (which need not prevent them from teaching interestingly and scientifically within such course, nor from offering the students additional academic lectures and seminars outside of it) such a suggestion is still indignantly rejected by most of my colleagues, who see in it nothing less than the destruction of academic freedom, the degradation (as they are pleased to put it) of the faculty into a technical school. For this reason I wish to say a few words about academic freedom.

It appears from my analysis of the development of the university and the faculties that at the beginning the state exercised no control over the matter taught, the methods of teaching, the length of the course, or the manner of examination. For all that, teaching was not free; it was under the control of the church. How the state later took the universities in hand, and how the influence of the church over these institutions gradually waned, has been set forth above. Thereafter the state exercised a certain degree of control over the teaching in the schools, so that the youth might not be taught views injurious to the state. This is quite intelligible and sensible! But who is the state? What is the state? Why should the state alone be considered stable in an eternally changing world? These questions have been variously answered at different times, just as with these variations the ideas of what constitutes a possible "injury to the state" through teaching have also been modified. When the old state felt so weak that it feared its own shadow, it went so far as to prescribe to the teachers at the universities precisely from what book or notes they had to "read," i.e., lecture, to their students, and checked up through police supervision every word that varied from the book. How far this was carried in other German states I do not know, but at the Austrian universities such control was, until 1848, at times very strict. Such severity is always a sign of fear, of political weakness and timidity. With the growth of political freedom and the people's control over their favorite form of government, educational liberty also increased, so that academic freedom is closely connected with the political development of the nations and has become a political slogan.

Academic Freedom.—Everybody knows today that political and intellectual freedom can be won and maintained only by dint of strict self-discipline, and that institutions of the community must be supported by intellectually competent leaders in organization and administration, and maintained through the subordination of personal sentiments and views to given legal conditions. I can therefore see no violation of my intellectual integrity if in the interests of the state a faculty as a whole dictates to me the time at and in which I must do my teaching, since it does not in any way impair my liberty to teach what and as I like.

I am not in favor of a compulsory curriculum, and yet I have found that even a carefully arranged program of study to be given for their guidance to the students on entering the university fills many professors with abhorrence, especially the older teachers. It might possibly require them to change their long-accustomed lecture hours, or to reduce the number of hours of their courses! This, they find, involves great inconvenience, and perhaps some pecuniary loss. The latter objection, which is much too seldom brought to the attention of the authorities, could easily be corrected individually by the government in the case of those professors who have accepted their position for life on the understanding that the traditional conditions continue unchanged. A teacher who is compelled to reduce his five-hour course to three hours, is to be compensated for the loss either by having the students pay the same fee for the reduced course—a trifle for the individual student—or, if the state does not approve of that, by the state itself—a trifling item for the state. If, then, the professor who thereafter accepts the post were required to do so under the new conditions, all difficulties would be obviated.

It is of great advantage to the teachers of secondary subjects (adjunct professors and lecturers) if the students pursue their course according to the suggested (not compulsory) plan arranged for their convenience and in their interest. The lecturers in the principal subjects—and it must be remembered that the lecturer or "Privatdozent" is not a member of the faculty—could, to be sure, schedule their lectures for the same hours when they are being taught by the professors of these subjects, and so fit themselves into the program. But the great fear of the more ornamental elements of the faculty is that because their courses are not mentioned in the student's program, he will give them even less attention than otherwise. The lecturers would then be thrown upon their personal drawing power, while the professors have the support of the system, and are, as the lecturers insist, bolstered up and made tolerable only by the system.

If that is true, then, of course, all our fond notions of equality of opportunity for our teachers are abolished. I was a lecturer (Privatdozent) myself for a long time and am thoroughly familiar with all these matters. After careful consideration, however, I had to confess that no faculty can exist without a definite code for both students and professors, that it is the duty of the state to see to it that such a code exists, and that all incidentals arising out of this fundamental proposition are a matter of minor importance. I knew all this long ago when I qualified as a lecturer, and if under those conditions, whose general reasonableness I had to acknowledge, I was for a long time unsuccessful in realizing my professional ambitions, I had no one to reproach but myself, deeply though it wounded my vanity, for having undertaken, under difficult conditions familiar to me, something which I could not carry through. In every avenue of life many thousands sooner or later fall by the wayside, either because, in spite of all effort, industry and ambition, their powers prove inadequate, or because they are carrying too heavy a pack and the road is too crowded, or because they have stopped too long by the way or have strayed from the path. Why should the lecturers presume to think that all of them must reach the goal they are pursuing? To give up a systematic and practical arrangement of the teaching program for their sake seems to me a most astounding, almost a frivolous demand.

PART III

THE STUDENT AND THE FUTURE PHYSICIAN

Preparation for the Study of Medicine.—Although most educated Germans expect the state to make provision for the proper teaching of medicine, there are some among them who dispute its right to lay down any conditions for admission of students to medical courses or to medical practice. I believe it is important to do both.

It would, indeed, be impossible to give medical instruction to classes whose previous preparation could not be determined by any standards of measurement, and to make such instruction equally intelligible and useful for all. Anyone who has had experience with the more amusing than educative effects of popular lectures on science and medicine upon an audience not scientifically prepared to understand them, will surely not undervalue what we usually describe as a secondary education.

We must realize that there is nothing more unnatural than to sit down and listen to the same people daily at a specified hour, to follow their train of thought step by step, and to continue to do this under the most difficult circumstances during several hours each day for months and years. To bring the human organism to the point where this is possible requires a long, careful and consistent training that finally makes second nature of such habits.

I once heard an eminent scholar complain long and loudly about the length of the lectures at an academy of science. He maintained that he could not follow a lecture on a scientific subject for more than three-quarters of an hour or at most an hour, even when the subject concerned his own field. Attentive listening is a trait so seldom found in society in general that men and women who are good listeners are always noticed. Listening is a special and indeed a charming talent, a mark of delicate sensibilities and good breeding. Where this gift is not present, nature's oversight must be laboriously corrected and the lack supplied. But while our experienced teachers would doubtless support this general view of the matter, some may hold, nevertheless, that the secondary school training is a much too cumbersome, expensive and clumsy apparatus with which to gain the ability to follow a series of daily scientific lectures. So far as the preparation for medical study is concerned I do not agree with this attitude. On the contrary, I consider our present *Gymnasium* course altogether suitable, especially for the medical student.

Latin and Greek.—It would seem unnecessary to waste words in defense of the intellectual, disciplinary value of the study of the Latin and Greek languages, or of the pedagogic importance of the classical historians of antiquity and the classic poets. A like degree of elasticity of thought can be attained by no other method of preparation, nor is there any other subject matter so well suited to fill the minds of boys and young men with exalted ideals and beautiful concepts, as the history and literature of the ancient world.

Added to this, the medical student has a much more immediate relation to and need of the ancient languages. It is only a matter of fifty years since the greater part of medical teaching at the universities was carried on in Latin. When the lectures were given in German, and when a national German science of medicine gradually developed, we neglected to invent and introduce a German scientific nomenclature. This was a thoroughly German mistake, arising out of our feeling that the acceptance of the scientific content was the first and most important consideration, and that the form of expression would take care of itself. Sporadic attempts, repeated even in our own days, to "Germanize" the language of medicine, have come to naught, so that our medical terminology has uncommonly few German technical expressions. It is peculiar that even the new words that must be coined to designate new observations and newly discovered processes, are rarely derived from the German language, seldom from Latin, but are usually taken from the Greek. One of the most German of men, Rudolph Virchow, to whom we are indebted for his standardization of medical terminology, created a predominantly Greek nomenclature, provided as a rule with Latin endings. This was generally accepted, and spread as a matter of course. In botany, especially in designating the lower plants, terms from the Greek language also predominate.

Although in the Middle Ages the writings of Hippocrates and of the Arabs were known only through Latin translations, and were taught together with Galen's extensive books, yet so many original Hippocratic expressions, not translated but merely Latinized, have come down to us, that a return to the original texts and linguistic purification have given a still more consistently Greek stamp to our medical terminology. Little of the Arabic has survived in modern medical language.

Since, as a rule, in German we use the etymological spelling rather than the phonetic, the medical student who cannot read the classics and is baffled by the spelling of every tenth or twentieth word in a medical work, and who is not able to make headway even with the help of a Greek grammar and dictionary, must find himself in a chronic state of mild despair, assuming that he really wants to know what he is reading, saying or writing. I admit that this *mélange* of Greek, Latin and German is an evil. The Italians, French and English had no such difficulty; they did not have to translate the Latin and Latinized Greek words, but could simply Italianize, Gallicize or Anglicize them. How the Slavs and Magyars manage the case I do not know. In Turkey instruction in the secondary schools and in the schools of medicine is still in French. All the efforts, especially in South Germany (the Würzburg school), to Germanize the foreign medical technical terms, have so far been almost without success. It produces an almost comical effect to say "Absetzung" instead of Amputation, and "Aussägung" in place of Resection. To force such changes, the teaching of Latin and Greek in the high schools would have to be positively forbidden.

Mathematics and Science.—Some professors of medicine and of the natural sciences criticise the preparatory course for giving too little attention to mathematics and to the natural sciences. They are quite right in asserting that the lack of adequate preparation and training in mathematical modes of thinking is a great handicap in the study of physics and of many phases of physiology, and often compels the university teacher to hark back to fundamentals in order to make himself understood. My experience, however, compels me to say that no scientific aptitude is so rare as mathematical ability, and that it would require an enormous expenditure of time to bring all entering students alike up to the high standards of the university.

In the well-attended *Gymnasium* at which I studied there were among the thirty or forty boys of any given class at most two or three who were able to solve a mathematical problem unaided. These were usually fellows untalented in other ways, who have since become obscure schoolmasters. Perhaps the fault lay in the method of instruction; possibly the method has since been improved.

Mathematics and the basic concepts of logic are assuredly important in training the mind to reach more orderly and more accurate conclusions, but I do not find that these sciences stand in any especially close relation to the study of medicine and to medical practice. The process of attaining an understanding of the natural sciences, and of gaining a scientific viewpoint in medicine is assisted in far greater measure by a lively imagination than by logic. Easily to reproduce sense impressions, to visualize a highly complicated sequence of events, to be able without difficulty to imagine all the different possible results of normal and abnormal processes—in short, to see a thousand things at once and to sense their interrelations—these are the essential qualifications for scientific research. The ready capacity to reproduce sense impressions imaginatively, the sharpening of the powers of observation, the orderly arrangement of mental images in vivid and living pictures, facility in the so-called inductive method of reasoning—these are the qualities that the teacher of science and of medicine must develop in his students; and to this end a certain amount of preparation is indispensable.

Geography and History.—Nevertheless, I am not of the opinion that a much more important place should be given the natural sciences in the *Gymnasium* at the expense of the classical languages (although there is much room for improvement in the methods of instruction), since it will suffice to present the most general concepts and views of natural history. Those who have the ability and the inclination for further study will eagerly absorb these rudiments and will carry on more advanced work later. Chemistry can be dispensed with altogether in the *Gymnasium* so far as the future medical student is concerned. As much of physics should be studied as is implied in the study of physical geography, to which serious attention should be given. Next to physical geography, I think nothing is more valuable to the future physician than the study of history. I have been struck by the fact that Von Zybel, whose views on the great significance and necessity of secondary training I share in other respects, is opposed to the extension of the teaching of history in the *Gymnasium.* As I conceive scientific activity, history and research are so inseparable that for me the one without the other is unthinkable. The genetic method of modern scientific investigation seems to me to be almost identical with the historical method. We want to know concerning all things perceived by our senses, *how* they came to be as they are, and why under the circumstances they had to be as they are, and why they could not have been otherwise. From this point of view there is no better preparation for the scientist than to arouse in him an interest in the evolution of the earth, of the human race, of nations, of states. The irrepressible urge to discern all things in their historical and genetic relations surely indicates talent in the natural sciences.

Modern Languages.—For the physician who wishes to educate himself beyond the minimum standards set by the state, a knowledge of modern languages is not only an ornament but in our day an actual necessity, although I should not like to impose this task on the *Gymnasium.* In this respect every man ought to stand on his own feet.

It is hard for me to free myself from the hoary North German tradition with which I have been inoculated, namely, that nothing short of graduation from the *Gymnasium* should be accepted as the stamp of an educated man. I find it difficult to imagine any other course of scientific development sufficient. In the meantime other generations have grown up, and other types of schools have come into existence, with which I am not well enough acquainted to be able to judge to what extent they are, or can become, adequate preparatory schools for the study of medicine. But I am quite convinced that the requirements for graduation from a Prussian *Gymnasium* represent the minimum of knowledge which I consider necessary for the medical student, and that the *Gymnasium* curriculum in general could hardly be more admirably adapted to his needs.

Entrance Examinations.—As long as we have such preparatory schools in German countries it is unnecessary to establish examination boards at the universities in order to submit candidates to an entrance examination, as is the case in France, Holland and England. Graduation from a *Gymnasium* has until now been so generally recognized as the necessary preparation for the university, that there is no need for a special entrance examination. All German-speaking universities require native students to have the graduation diploma of a *Gymnasium* in order to matriculate as medical students. In the Swiss Republic, the term "native" applies, it is true, only to natives of the canton to which the university belongs. Toward foreigners the universities are generally much more lenient. They need only produce a certificate of moral character, or an honorable dismissal from another university. This indulgence is of practical consequence at only a few faculties, since the *Gymnasium* diploma is a prerequisite to the later examinations for the degree and the right to practise.

The Elective System.—In theory the student at the German medical faculties is free to arrange his studies, to decide what courses he will take, in what order, and how often he will repeat any given course; but for all those who wish to limit themselves to the minimum time legally prescribed for admission to the qualifying examinations, any marked departure from the usual course of study is scarcely possible, while anyone who wishes to study beyond the minimum time can follow his inclinations and exercise his talent more freely after completing the examination. Moreover, in most countries where universities of the German type are to be found, an excessive waste of time is prevented by so many indirect limitations that any particularly harmful influence of the elective system is hardly to be feared, certainly not in the case of students who know what is expected of them and what they have come to the university for. The disciplinary measures suitable for boys cannot be applied to spineless, immature, stupid, frivolous, ill-bred young people between the ages of eighteen and twenty-five. Even with the enforcement of the most rigid school discipline they could only be compelled to repeat the early courses, and as a last resort they could be expelled, which is exactly what happens automatically at present. Under the prevailing system there is less danger of destroying the student's self-respect, even though it may make parental control more difficult and although the student often remains unaware of his shortcomings until just before the examination. Not a few such neglectful students brace up toward the end of the course, and the will-power then developed is an asset for the rest of their lives.

I do not believe that marked talents are hampered or stifled in their development by a strict discipline such as formerly existed at several German universities, especially if the students have the means to carry on their scientific work as they please after completing their professional studies. But neither do I think it possible to make energetic, industrious, intelligent physicians out of slack, lazy, stupid students, by means of school-like discipline at the universities.

With the average student custom and tradition as they have developed under the different faculties, and as they should be fostered (as I have explained before) by the recommendation on the part of the teacher of a systematically organized program of courses, are sufficiently influential to prevent him from straying from the beaten path. What young people gain by forcing themselves to work, free from any immediate compulsion, by refraining from diversions, and by revisualizing their objectives when these may have been temporarily obscured, is of permanent value in building their characters for life. Lack of concentration, laziness and slackness exact their penalties at the university chiefly in the form of loss of time and money; in later life they are occasionally paid for in loss of office and honor. In educating our boys, we look chiefly to the acquisition of as much knowledge as possible, while English education, for example, works less to this end than toward character development. Consequently the student in the *Gymnasium,* because of the profusion of compulsory subjects, has hardly a chance to become aware of his individuality. If we were to continue this course at the university, the mature man would have to contend all the more with character defects and passions which he should have learned to recognize, correct and control while still a young man.

On the whole we have reason to be satisfied with the results which we have achieved with our limited academic freedom. We must always keep in mind the amount of learning and skill attainable in the usual minimum of time for the course, and always be able to put ourselves in the places of these young men.

Student Types.—In these matters we must not take as a standard the abnormal educational conditions which prevail in large cities, notably at Vienna. In such a distracting confusion of people, and among interesting happenings, only highly talented boys who have either extraordinary powers of quiet concentration or vigorous and ambitious natures, can be educated to become ambitious youths or men of serious purpose.

The Jews at Vienna.—I should like to enlarge upon the situation of the medical students at Vienna in somewhat greater detail, the more so since it has recently been discussed repeatedly in political newspapers in a manner almost insulting to the rest of the German universities. It has been rightly said that at Vienna there are more poor students than anywhere else, and that they ought to be assisted because living at Vienna is so expensive. Yes, if the question were one of poverty alone! A person is called poor who has not sufficient means to keep up with the social environment in which he has been placed by birth or by circumstances beyond his control. That is not the problem at Vienna. Young men, mostly Jews, come to Vienna from Galicia and Hungary, who have absolutely nothing, and who have conceived the insane idea that they can earn money in Vienna by teaching, through small jobs at the stock exchange, by peddling matches, or by taking employment as post office or telegraph clerks in Vienna or elsewhere, and at the same time study medicine. These people, who present to anyone not acquainted with Viennese conditions a most puzzling problem, who are not seldom inherently queer, but whose numbers are fortunately diminishing year by year, could hardly exist anywhere else. They could not study at Gratz or at Innsbruck, where living is much cheaper, because they could earn nothing in those cities: they can study only at Vienna. That this condition continues, although in limited degree, is due to the fact that the public, the railroads and the professors support them; for there is a prevalent obsession that poor young men, who aspire to a scientific career in spite of many obstacles, must have an invincible urge to higher things and must be highly gifted. Both assumptions are false; the folly that drives these individuals to study is their vanity, and even more the vanity of their parents. Most of them possess meager talent for the natural sciences, and the majority are utterly unfitted for the career of medicine. Granted that with some of them an ideal aspiration is present, it does not by any means follow that they are talented.

Most people with great specific talents are industrious, ambitious, and eager for achievement; but it happens quite as often, both in the realm of art and of science, that altogether untalented people are possessed of infinite patience and an unspeakable mania to achieve. Who does not know the young men who paint and compose music with a feverish ardor bordering upon imbecility, and whom no kindly counsellor, no, not even their thousandth fiasco, is able to convince that they are untalented and stupid, and will never accomplish anything even if they work themselves to death?

Such empty-headed strivers, with their purblind eyes, hands like lead, and brains like clay, with a dictionary knowledge and a pathetic incompetence, are to be found in large numbers, especially among these poor medical students. They tremble when they are spoken to during examination and lose their mite of intelligence completely when one looks at them. They often understand so little German that they can grasp neither the language nor the sense of the questions, and are quite incapable of expressing their thoughts either in German or in any other tongue. Are academic freedom and the scientific method of instruction to be held accountable for failing to make good physicians out of such material?

Nor would it be so bad if poverty, the lack of a warm room or of food and clothing were alone responsible for preventing these students from regularly pursuing their studies. There is another reason, in addition to and beyond poverty, and one which is usually overlooked: the entire lack of refined breeding at home and of association with educated people during their student days. No profession except, perhaps, the clergy, is so often exploited by uneducated families who aim to climb into the cultured classes on the shoulders of the younger generation, as is the medical profession. For the Jews a medical career offers comparatively fewer difficulties than any other, and if a doctor once achieves a moderate success, countless others will attempt to duplicate it.

Now, this career depends very much on talent of one sort or another, but it also depends on luck, and that is why it attracts so many. To the untalented, talent looks like mere luck, and everyone believes that luck may come his way. Thus it appeals to the gambling instinct. The ambition to climb into a higher social class, and fortune hunting are, in fact, very often the motives that lead people to study medicine. If there were really an irresistible urge and inner compulsion that defied even starvation, such poor students ought to be found in equal numbers in the field of the pure sciences, of philosophy, of history and of philology; but this is not the case.

A Jewish merchant in Galicia or Hungary (the Hungarian Jews have the worst reputation among the Viennese students themselves), earning just enough to keep himself and his family from starving, has a very moderately gifted son. The vanity of the mother demands a scholar, a Talmudist, in the family. In the face of countless difficulties he is sent to school and passes his final examination with great effort. Then he comes to Vienna with his clothes and nothing else. What impressions, what stimuli can such a boy have received? He has been surrounded all his life by the pettiest and most miserable circumstances, nor will he ever be able to rid himself of this narrowest of horizons. Now he comes to the university; and it must be said that it is the best and worthiest among them who seek to earn their living by giving lessons in preparatory school subjects. So this outcast in the Viennese world must first of all look for pupils, but he finds that the lesson hours conflict with the lectures. Still, he must live before he can study; the private lessons that he is to give cannot be postponed; he must accept them, and therefore cannot attend his classes. In what mental atmosphere, in what world of ideas does such a person live? Where shall he find renewed stimulus, where sympathy for his impressions and aspirations?

What is awakened in him by the lectures goes to sleep again outside of the lecture-room. Indeed, our teaching methods were not intended for such students, or for such conditions, for those methods demand a free mind and free intellectual movement. Such people are in no way fitted for a scientific career. If by way of exception, one of them should succeed in some measure, it must be regarded as accidental, and no state institutions can be maintained for such rare and exceptional cases.

German Students.—I know very well that the prospects which the profession of medicine offers for early earning power are very small, and that young men of some means will have no particular inclination toward a calling in which, presumably, they will use up the little they have before their practice supports them. There can be no doubt that other careers offer far better chances for the sons of fairly well-to-do *bourgeois* families. It is, therefore, I am sorry to say, the exception rather than the rule when young men of means take up medicine as a profession. This is the case in other parts of Germany as well; but there the medical profession is recruited more largely from among the sons of ministers, of petty officials, of school-teachers,—in short from social classes that do, indeed, lead an economically circumscribed existence, but whose members in general nevertheless belong to the educated classes. The fathers have studied at the universities; at home, in the family, and among their relations the spirit of culture and the thirst for knowledge prevail. The father sees his youth, already idealized in his own mind, renewed in his son, and desires to give him, too, this glow of youth. At the university, students from such families seek association with the groups from which they have sprung. The form and content of the lectures find a soil well prepared in every way, in which the teaching takes firm root. In these circles, moreover, parents and relatives have the insight to appraise the talent of their children and to keep the untalented from studying. Among the non-Germans studying at Vienna a lack of money is often coupled with the lack of talent and of decent home training, an unhappy combination for the student of medicine.

Aside from these undesirable elements, larger in proportion in the student body of the gigantic University of Vienna than anywhere else, and therefore unfortunately represented in considerable numbers among the medical students, there is also a large and constantly growing group of very well-bred and well-trained young men, who devote themselves to study with great eagerness and endurance, and possess the means to study beyond the minimum period required. To this group belong the great majority of the German students at Vienna, the students from the ancient German imperial lands, including particularly the greater part of Bohemia, which contains a preponderant number of Franks, and has sent these and the Germanized Czechs as prominent teachers to the German universities.

I am familiar with the types of students at many German universities, especially with those of Berlin and Zurich, and I have the impression that in their hospitality toward ideals and particularly in their susceptibility to emotional inspiration, the German elements in the Viennese student body are nowhere else excelled. Both the desire and the capacity for solid education, as well as the preparation at the *Gymnasium,* are not less excellent in German Austria than in other German-speaking countries so far as I am able to judge. Why, in view of the abundance of talent and enthusiasm for knowledge, the number of those who turn to natural science, to law, philology, history and philosophy is not great, is a very complicated question. To answer it would lead me too far into the field of history, politics, religion and social customs.

In admitting, as we must, that side by side with these able, for the most part German, but also Italian, pure Magyar and Slavic elements at Vienna, many candidates appear at the examination of whom one can say, after a few questions and a brief observation of their work, that they are not fit to be physicians and will never amount to anything, we are facing a situation that is sad, indeed, not only for the candidates and their future patients, but for the teachers and examiners themselves.

But although there are many studying at Vienna who are not of the elect and who are trying to force themselves into the medical profession, yet to conclude from this fact that modern teaching methods are bad, and that the elective system leads only to recklessness and laziness, seems to me a very doubtful and highly unjust inference. To reduce the German method of university instruction to the level to which the lay surgeons were formerly restricted, expressly for the sake of these elements that are piling up at Vienna, or to organize separate schools in which to transform stupid, ignorant, starving students into stupid, ignorant and starving physicians,—these are measures for which I trust that every intelligent parliament, whether it convene as a Reichsrat, Chamber of Deputies or Imperial Council, at Vienna, Munich, Berlin or Zurich, will refuse to vote money.

Taken all in all, the tares in the student body at Vienna, which are not so easily weeded out, have their roots not so much in the conditions prevailing in the university as in the mixture of national elements that overcrowd the metropolis in which the university is situated. In the interest of truth I have repeatedly pointed out that the undesirable elements are not German, but Galician and Hungarian Jewish elements which, as before stated, can flourish only at Vienna.

Academic Freedom.—The expression "academic freedom" which became popular in 1848, when every word that hinted at freedom became a slogan, has since then been associated with reminiscences of the barricades, and consequently makes most people who lived through that mad period as adult men, nervous by its very sound. In Prussia no changes were made in the method of teaching and study at the universities as a result of what happened in 1848, while in Austria a new educational system was created and a new organization of universities and faculties was effected. I have already discussed freedom of teaching elsewhere, and need only add that even in Austria it could only be formally and externally restricted. When, for example, Hebra announced lectures on skin diseases "according to Cazenave," the effect was merely funny, for anyone who knows this teacher knows that Hebra can teach only according to Hebra. The external form determined by law could not curb the great spirits. It was otherwise with freedom of study, with the elective system. Until 1848 the course of studies for medical students was prescribed throughout. They had to follow it if they wished finally to earn one of the many medical degrees. A return to this state of affairs is desired by some of my older colleagues on the medical faculties, and the blessings that would arise from such a system are widely advertised.

Professional Certification.—For anyone who wished to take no examination at Vienna, but simply as a foreigner to attend several courses at the university, this regulation had no significance. In all probability there were in all the faculties special students working with those in the regular course. Students of this sort were watched by the political authorities as suspicious persons, because they fitted into no known category.

In the other states of the German Federation there were at that time certain preliminary requirements, but there was no inquiry into these until the student reported for his examination. In these matters the events of 1848 effected no change.

The elective system is therefore intimately bound up with the examinations and their historical development. On the basis of the material at my disposal, I can give an adequate account of this matter only for Austria and Prussia.

Prussia.—Not until the beginning of the last century did the Prussian government begin to concern itself actively with the control of the personnel of the profession of healing. Until that time there were the following groups of medical practitioners: 1. Those on whom the faculties had conferred the degree of Master, and who after their graduation were called Doctors; 2. Lay surgeons provided with a Master's certificate, to obtain which the candidate had to pass an examination given by the masters of the guild, by order of the Elector in 1538. With the Surgeons' Guild was incorporated the Barbers' Guild, a partnership which was not dissolved until 1811. After their separation from the Barbers' Guild, the surgeons were relieved of the unpleasant duty of practising in conjunction with a licensed barber-shop!

Until 1725 any doctor of medicine graduated from an Occidental Christian university could practise in Prussia. Either because at that time a great laxness in granting medical degrees prevailed at the universities, or because the state wished to protect Prussian physicians from foreign competition, an order was issued on September 27, 1725, by which Masters of Medicine were only entitled to practise when, after taking a course in anatomy, they had passed an examination conducted in Latin by several members of an official medical and surgical board appointed by the government as the highest medical authority. This is the beginning of the Prussian State Examination which has since been introduced in various German-speaking countries, and which is historically based on the university examination for the degree; indeed, to a certain extent it may be said to constitute the second half of that examination. By this provision the state deprived the faculty of the right to grant the privilege of practising; only in part, however, since the examination by the faculty still had to come first. This arrangement continued unchanged in principle for 144 years, until the framing, September 24, 1869, of the rules for examining candidates for the right to practise in any part of the North German Federation.

Prussian State Examinations.—These beginnings of a state examination were supplemented in 1789 and 1791 by adding an examination in the German language "on the most important phases of medicine." In 1798 the practical clinical course was included, which made the examination a repetition and amplification of the examination for the degree.

A similar examination for surgeons was instituted in 1725 and considerably expanded in 1788. There were surgeons of the large cities (Class 1) and of the smaller towns and rural districts (Class 2). Permission to practise in a given district had to be granted by the provincial government, and the character and extent of their medical and surgical functions were defined by law, though there were frequent collisions. Obstetrics (especially operative obstetrics) was practised only by the surgeons, until 1791 without examination or special permission. Thereafter arrangements were made for the granting of such permission to physicians and surgeons; only those, however, who were already physicians or surgeons were admitted to the examination.

Regulations of 1825.—Further regulation and definition of these conditions, with particular reference to the growth of the country, followed in 1825 under Minister von Altenstein.

In these regulations the following categories are established: 1. Doctors of Medicine graduated from the national universities (Halle, Breslau, Königsberg, Greifswald, Berlin, Bonn). Graduation from the newly organized *Gymnasium* becomes a requisite for matriculation into the medical faculties. In 1804 the length of the university course had been set at a minimum of three years; in 1826 the legal minimum became four years. The examination for the doctorate, which was likewise regulated by the state but was administered by the faculties, consisted of a written examination and an oral test, for which in 1826 the "tentamen philosophicum" was made a prerequisite by law. This consisted of an oral examination in logic, psychology, physics, chemistry, botany and mineralogy, and was conducted by the philosophical faculty, with whom sat the dean of the medical faculty.

Aside from the certificate testifying that he had passed the examination, the candidate for admission to the examination for the doctorate, and afterwards to the state examination, had to produce proofs that "he had studied the science of healing and the related basic and subsidiary sciences at a university for four full years, and that he had spent the fourth year in attending practical laboratories." At Prussian universities there was never any larger prescription than this until very recent times, about which we shall have to speak later. Under this rule, attendance at the clinics only was obligatory; for the rest there was no obligation to take particular courses except that imposed by the necessity of passing the examination.

The following general order was issued to the professors (Ministerial order, January 7, 1826): "At the same time the Ministry of Education requires of the faculties that in arranging and announcing their half-year courses, they shall give due consideration to the state regulations, so that the students under the medical faculties may have every opportunity to meet the requirements of the state examination." Thus there were no detailed instructions given to the professors. I have already explained that in view of the present complexity of medical study I consider it desirable to go further in this direction, and should like to see courses of study arranged in detail by the faculties, in order that the state may be better able to supervise medical instruction, and may not permit itself to be confused by silly complaints about the incoherence and superficiality of the instruction.

The graduate was compelled to take his state examination before the "High Examining Board" at Berlin. Exceptions to this rule were made occasionally for very poor students who had passed their *Gymnasium* courses and their university courses with special distinction. For such a case a "Special High Examining Board" was appointed, but the favor was extended only to residents in outlying sections of the country remote from Berlin, there being at that time no railroads to Königsberg, Coblenz or Greifswald. A fairly high price had to be paid for the right to practise because of the necessity of going to Berlin for the examination and staying there for several months; indeed, the medical career had become in every respect much more difficult than formerly. There was no lack of protests and complaints on the part of the universities, the medical students and the authorities, but Minister von Altenstein remained firm, and in a circular note addressed to all universities and authorities concerned (July 2, 1837) he said:

> "In renewing the examination regulations of December 1, 1825, it was determined, not without adequate reasons, that the High Examining Board shall in future as in the past have its seat at Berlin. The reasons which, among others, have entirely justified these regulations are:
>
> "(1) The necessity of keeping this Examining Board under the constant and immediate supervision of the Ministry, and of subjecting the higher medical officers of the same category to an absolutely uniform examination, in order to determine their abilities by one and the same standard;
>
> "(2) The insufficiency in the different provinces of the necessary material for the examination, and the impossibility of finding in the outlying districts enough high-class men trained in every branch of medicine, for the Examining Boards;
>
> "(3) The fact that medical authorities still think it desirable to become personally acquainted with the candidates to be tested, and the advantage that accrues to the candidates themselves by such closer personal acquaintance, which they are able to gain only through the constant use of the museums, natural history collections and practical schools, resources which exist in such profusion only at the capital.
>
> "Experience has shown, moreover, that these requirements have had a most salutary effect. Furthermore, it has been determined for equally good and obvious reasons that the members of the Examining Boards should from time to time alternate as examiners in the various subjects, and that no professors should, so far as such a restriction is possible, be

the examiners in any subject which they have themselves taught, or in which they have examined the candidates in the university examinations for the degree."

The Examiners.—It is certain that the reasons here developed by Von Altenstein for giving the examinations exclusively at Berlin contain much that is valid even today. I consider it altogether wrong in principle and impossible in practice to exclude the professors from the Examining Boards, a practice which has already been abandoned in the German Empire. Since many physicians, lecturers and adjunct professors would like to participate in the examinations—the latter perhaps in the hope of increased attendance at their courses—and since it is so often loudly asserted that only an experienced practising physician can judge whether a candidate has sufficient knowledge to be able to practise independently, I shall leave entirely aside the fact that in Prussia the principles of Von Altenstein already have been abandoned, and that at Vienna they were never accepted, and shall once more turn the searchlight on this examination bugbear. I myself was examined at Berlin under the rules described above, and later was examiner there as substitute for my teacher, Von Langenbeck. I have been examiner at Zurich in the examinations for the degree, and have also acted as member of the medical council in the state examination at Zurich. Here at Vienna I have been an examiner under both the old and new regulations. I trust, therefore, that I may be credited with some experience in this matter, although I shall always be told that, being a professor, I must *a priori* be partial and irresponsible as an examiner, and that I know nothing about the actual needs of the practical physician.

No one questions the fitness of the teachers of the elementary and secondary schools, of the *Gymnasium,* of the polytechnic institutes, of the forestry schools, etc., to examine their students. In the case of the university professor this fitness is admitted, strange to say, only conditionally, and only as far as the faculty examination is concerned, which as a rule is a collective test. If the candidate fails he must take the whole examination over again. It is rumored of the professors that they like to have the students fail in order to duplicate their tuition fees. In order to bring this about in the examinations for the doctor's degree, the candidate would have to fail in several subjects, and there would have to be a conspiracy in the faculty to select the unfortunate candidate as the victim of their avarice. But they have no guarantee that he will repeat the examination at their university; perhaps he will go to another university and the money will flow into the pockets of other colleagues! How terrible! No—there is really no money to be made in this way, even if such were our aim. Nor have I really ever heard anyone complain that the examination for the degree was being made too difficult. Since the right to practise ceased to go with the degree, the university examination has come to be looked upon as in a sense only a preliminary to the long, hard state examination that follows.

If the faculty examinations at the Prussian universities were lax until 1725, they have become more so since that time, because taking them no longer involved any actual responsibility. The same thing was true of the disputations and the dissertations. Candidates for the doctorate who had no ambition to write as good a dissertation as they could for their own sake, were easily able to comply with the form. Professors who had no sense for the historical significance of the medical degree were not able to invest the dissertation with dignity.

At first (after 1725) the state examination was intended to supplement the faculty examination, especially in anatomical subjects and practice at the sick-bed. Later it was intended to exceed the faculty examination in difficulty, and the "High Examining Board" in effect undertook to pronounce a super-judgment above and beyond the faculty, because the state was unwilling to accept the decision of the faculty.

Where, aside from the professors, were the men to be found who could examine more scientifically, more precisely and more practically than the professors of so-called theoretical and practical medicine? The Minister admitted that such men were to be found only at the capital, but on principle he excluded all professors. Then he ordered a search to be made; and what did he find? When in 1853 I took my state examination the "High Examining Board" consisted almost entirely of full professors of the Berlin faculty, two or three adjunct professors, and two or three lecturers attached to the same faculty. Since the clinical examination took such a vast amount of time and the number of candidates was so large, two boards of two members each had to be chosen for each of the three practical clinical examinations, for no one would have been willing to examine all the candidates. Altogether, two examiners in anatomy, four in surgery, four in medicine, and two for obstetrics were required. For the final general examination there were, besides one member of one of the former boards, four new examiners in materia medica, physiology, natural science and medical jurisprudence.

Even in Berlin there were, outside of the university circles, no physicians willing to undertake the very troublesome and poorly paid office of State Examiner. Or rather, those whose services were desired by the state did not wish to sacrifice their time; and on the other hand, the state did not wish to appoint young and inexperienced persons who would gladly have undertaken the task. When later, with the increase in the number of candidates, some of the professors in the practical subjects emphatically declined election as members of the examining boards—and this despite the fact that these boards had been increased—because the task took too much time, the Ministry found itself in a grave dilemma. It had to descend progressively to persons of inferior standing, even to doctors who had previously been coaches, and who now crammed students for their own examinations!

Where the students are not in a position to know the methods and views of their examiner from contact with him in his own lectures, they can hardly do otherwise than coach for his examinations. It is a great mistake to think that an examination in medicine can be taken and passed in an altogether cool and objective fashion. That might be barely possible in anatomy, but although with strange examiners a student who has worked hard and is not too stupid may pass, he will find it very difficult to get a good rating, if in cases of doubt he does not know the views of the examiner. The examiner cannot give a student a grade of "very good" or "excellent" if the latter presents views which the examiner holds to be altogether wrong, although he may know very well where the student has learned his opinion and that he has properly grasped the "erroneous" idea. Such collisions occur constantly and it is just as well that the public knows nothing about them. Examining has always been for me the hardest and the only disagreeable task that my teaching involved.

Let us imagine a candidate who has studied faithfully at the university, who has absorbed most of the views of his teachers and is brimming over with them. At the examination he falls into the hands of a middle-aged practitioner. Now, in view of the present rapid flux of medical science, these two will not understand each other at all, or will require a long discussion to reach an understanding. Perhaps the examiner writes his prescriptions in terms of ounces and grains; the candidate knows nothing about that because his instructors, quite properly, have thought it unnecessary to teach it to him. He figures and prescribes in grams. Thus the mood of irritation and anxiety that spells ruin at an examination has already been created. And then consider the difference between the weight attached by the examiner to his own views and to those of the candidate!

Anyone who is not master of his subject, who lacks experience in examining or familiarity with the candidates' psychological state; who does not know exactly *what* is taught today and *how*, and is therefore unable to estimate what the candidate could be expected to know, always examines too strictly, and his method is generally wrong. Examiners can be divided into those who try to elicit from the candidate what he knows, in order to get a sufficient number of correct answers; and those who believe that the purpose of the state is to find out how much the student *does not know*. That he knows something must be assumed, they believe, even without examination. Thus they are concerned to determine whether the number of questions not answered is so great that he must be rejected. The former type of examiner is sought by the candidates, the latter is feared by them. Against the latter category the candidates are altogether defenseless, since a specialist in any subject is always able to ask enough questions which a student cannot answer, to cause him to fail.

Why a professor who has given a candidate a short examination for the doctor's degree should not be competent later to subject the same candidate to a thorough and at the same time practical examination in the dissecting room or at the sick-bed, I do not understand at all. And I deny emphatically that anyone should be more competent to do this, simply because he is not a professor.

If the candidate fails, which, by the way, should happen only with the concurrence of a second examiner, he will repeat the examination in three months, and can hardly make better use of his time than by attending the courses of his terrible examiner. Should there be danger that the professor will not give the candidate this permission, then let it be the rule that no professor shall receive a lecture fee from the candidates who have failed, but that this be paid into some other fund; to remit it entirely is not wise, for to the candidate the pecuniary loss will be quite as severe a penalty as the loss of time.

On closer scrutiny the objection that the professors do not know the needs of the practical physician and that it ought to be left to the physicians themselves to determine what is useful in the practice of their profession, and to test the candidates on these points, seems to me to be so much nonsense. Because a practical physician makes little or no use of anatomy or physiology, and therefore remembers little of these subjects, should the little that he knows be regarded on principle as sufficient to equip a practising physician? Such an assumption is pure imbecility!

Surely the task and object of the study of medicine is far removed from such ideas. At the end of his course the candidate ought to have reached the highest level of knowledge in the field of medicine and its subsidiary sciences attainable for him within the limits of his time and equipment. Indeed, for most of these young people the examination period represents the high-water mark of their intellectual capacity. Each succeeding generation ought to start higher up in the scale of progress than that which went before. If a young physician were to be content with such knowledge of physiology as an old doctor still retains, the educational level of the profession would sink lower with each generation.

The routine of an old practitioner in prescribing remedies is surely not the highest goal we aim at with our students. They can learn all that in a few weeks without studying the medical sciences. That physicians defer to the skill of the clinical instructors and in emergencies call them in for consultations and operations, shows quite clearly that the clinical instructors are capable of judging the needs of the practical physicians. As physicians, too, they are usually far more practical than the practitioners.

There seems to me, therefore, to be no need to look for other examiners than the professors of the different subjects. In their appointments to the faculty the state ought to stipulate this duty, so that it would be impossible for them to evade this very irksome service.

Medical Categories.—Another passage from the regulations of the Von Altenstein régime of the year 1825, which, because of the too rapid development of the science, proved in the course of time to be impracticable, is the following: "No member of the High Examining Board (which was appointed annually) shall continue for more than one, or at most two years, as examiner in any one subject; all members are to change about in such a way that the personnel of the entire examining board be new each year." In the end the government was glad if an examiner could be found who was willing to retain his post.

The medical profession (the Medical Persons, as they are officially called in Prussia) was divided according to the regulations of 1825 into a large number of historically interesting categories. The doctor's diploma of the faculties stated then, as now, that the holder possessed the degree of "Doctor of Medicine and Surgery." The student had to earn this degree in order later to become, (1) a practical physician (*Medicus purus*); (2) a practical physician and surgeon (*medico-chirurgus*) who, on passing the examination with a high grade, might add the title of "operator"; (3) to take the examination for district physician; or (4) to become a lecturer (*Privatdozent*) at a university.

The category of "practical physician" and the additional title of "operator" were abolished by the Regulations as amended October 2, 1825 (Von Raumer).

The Medical Persons without degrees were divided into surgeons of the first and second class.

The surgeons of the first class, who could be examined only at Berlin, had to prove by certificates or a previous examination that they possessed—

(a) The required schooling and understood at least enough Latin to translate the pharmacopeia and an easy Latin author, and to write a prescription correctly; and

(b) That they had either completed a systematic three-year course in medicine and surgery, had acquired the necessary practical skill at a recognized school, or that for at least two years they had attended the required medical and surgical courses, and had served for the same length of time as surgeon of a lower category in the army or the civil service.

The surgeons of the second class were examined only by a medical board, either at the capital or in the provinces; their course was described as "lower surgery." To be admitted to the examination for surgeons of the second class the candidate had to show that he—

(a) Had either served the prescribed seven years' apprenticeship required by the medical edict of 1725, or

(b) That he had served as a surgeon of lower category in the army for at least three years, or

(c) That he had acquired the necessary knowledge and skill by regular attendance at the public teaching institutions.

In the last case the candidate had to show that he had successfully completed a full course of study at a school for surgeons within the country. If he could not do this, he had at least to produce proof that he had heard lectures at other institutions, which had to include courses in bandages and instruments, fractures and dislocations, operations and surgical clinic. At the same time he had to prove that he had attended the clinic not merely as an auditor but as an actual participant, that he had studied anatomy and had taken part in practice in operations on the cadaver and the manikin.

The examination for graduate physicians was divided into the following parts:

(1) Anatomy (demonstrations of the *situs viscerum*, the making of an anatomical preparation, oral examination).

(2) Clinical medicine: Taking over a patient; examination of the case; daily visits to the patient for from eight to fourteen days; two final diagnoses.

(3) Clinical surgery (as in No. 2, but with no attention to surgical technic).

(4) Final examination.

For graduate practical physicians and surgeons the same examination was required, with the addition of a technical surgical examination including application of bandages, the use of instruments, and operations on the cadaver.

For surgeons of the first class, the same examination as above, but entirely in the German language, and on the subject of internal medicine an easier practical examination.

For surgeons of the second class:

(1) Three written examination papers.

(2) Anatomical and surgical examination; making of a section, or the demonstration of a preparation; bandaging, and minor operations on the cadaver.

(3) Surgico-clinical examination at the bedside.

(4) Final oral examination before three examiners, chiefly on minor surgery.

The Right to Practise.—Only the graduate physicians and the surgeons of the first class had the right to establish themselves and practise where they pleased, but the graduate physician had to confine his practice to non-surgical cases. The surgeon of the first class did, indeed, have the right to practise where he pleased, but in any place where there was a graduate physician he could accept no medical cases. Consequently he preferred to establish himself in small towns and villages where there was no physician and where he controlled the entire practice of medicine, for in the towns of moderate size there were not enough major surgical cases to yield him a living, and minor surgery had to be left to the surgeons of the second class.

Inasmuch as instruction in obstetrics was neglected at the universities until 1852, because no examination in this subject was included in any of the tests so far mentioned, it became necessary to take additional practical courses at the maternity hospitals. After the completion of these courses the state held an examination conducted by the provincial medical boards, this being a theoretical and practical test in the manner of the clinical examinations. Anyone who passed this test could use the title of "obstetrician," which, of course, helped him in his practice. To be admitted to this examination the candidate had to be a graduate physician, a graduate physician and surgeon, or a surgeon of the first or second class. The examination in obstetrics was often taken by members of the last three groups; graduate physicians rarely took it.

The title of "oculist" could also be obtained by means of a special examination, which was, however, seldom taken, since surgeons were permitted to treat diseases of the eye.

The title of "dentist" could be earned by surgeons by means of a special examination, but since it was unnecessary, it was rarely done. For individuals who were not surgeons, and who wished to advertise themselves as dentists there was a somewhat complicated examination, given by the Medical Board.

The Government Service.—The examinations set by the Prussian government according to the rules of 1825 for those who wished state employment as district physicians as well as for those who desired positions as public surgeons, were of special significance and of no little difficulty.

"Only graduate physicians, and of these preferably the most distinguished, who are at the same time obstetricians, will be admitted to the examination in state pharmacology, given for those who desire appointment as district physicians." This examination could only be taken at Berlin before the "Scientific Deputation for the Practice of Medicine in Prussia." It included an oral, a practical and a written test, and in the latter very comprehensive papers were demanded.

Only surgeons of the first class who were also obstetricians could become "public surgeons." The examination for this post was much like that for the office of district physician, but was on the whole easier. It was conducted by the medical board of the province.

Counting all the various combinations that were legally possible under the foregoing examinations, there were nearly twenty categories of "medical persons," each of which could legally claim special rights within the limits of its medical practice. This extraordinarily artificial, baroque structure, which had taken about fifteen years to erect, could not long withstand the ravages of time. There were three chief reasons for its downfall:

(1) The many eligibility conflicts as to qualification and eligibility which were bound to arise because of the complexity of the system;

(2) The rapidly advancing development of medicine, which accentuated the differences between the various categories and between the younger and the older members of the profession; and

(3) The social and political views of 1848, which tended to equalize the standing and the rights of the members of any given profession, and encouraged the popular demand that the practice of medicine be freed from state control.

Even before the medico-surgical schools, at which most of the lower surgeons were trained, were closed in 1849 and 1850, this category of medical persons tended to disappear; it was officially abolished by the regulations of October 8, 1852. According to these rules no more *"medici puri"* were created, and obstetrics was made a compulsory part of the state examination in medicine. The special examination for oculists was dropped. After 1852 only graduate doctors were approved by the High Examining Board at Berlin, as "physicians, surgeons, and obstetricians" with full rights to practise anywhere, after passing the required examination. A state examination for dentists was retained, and the examination for district physicians was continued, but by an order of January, 1850, was made even more difficult, since the number of applicants was very large. Correspondingly, the candidates for the office of district surgeon gradually vanished, and while these places were retained in a somewhat modified form, they were finally given only to those candidates who had passed the test for district physicians.

Changes in Medical Categories.—As a further result of the simplification of the medical personnel it became necessary to develop a new category of medical assistants for minor surgery and nursing, with which to replace the surgeons of the second class. We now have the "medical assistants," "orderlies," "surgeon's assistants," "barber-surgeons," "deaconesses," "brothers and sisters of mercy," classifications which developed rapidly in the course of the recent wars, during which the need for additional medical help became suddenly very urgent. The training which this personnel receives at the hospitals is in part a purely practical one, and in part is based upon very practical text-books. The training of midwives so that they might render a more general medical service was also improved, so that Prussia is now well supplied in these directions, although regulations for examining these categories, and examining boards for that purpose are still lacking. Thus far the certificates issued to these individuals by the hospitals have sufficed and have been accepted by the state authorities and the municipalities. The fees for the services performed have also been fixed, while their right to practise where they please is subject to very few restrictions.

Revision of the Examination.—Apart from a few changes, tending as a rule to increase in difficulty certain parts of the state medical examinations, the following new subjects were included: physiology (1856), ophthalmology, pathological anatomy, public sanitation (1869). Of special importance, however, was the changing of the philosophical preliminary examination, the *tentamen philosophicum* into a *tentamen physicum* (February 19, 1861) which had to be taken at a university and which was and still is a prerequisite for admission to the faculty examination and the state examination. The subjects of this examination are: anatomy, physiology, physics, chemistry, descriptive science (zoölogy or botany or mineralogy). The examinations in logic and psychology as well as in any individual natural science were dropped. Remonstrances on the part of several of the philosophical faculties, whose members felt their incomes materially curtailed by these changes, were answered by Minister von Bethmann-Hollweg in a detailed circular letter of July 20, 1861. This examination was now prepared and supervised by the dean of the medical faculty, whereas the old examination had been administered by the dean of the faculty of philosophy. It had to be taken "at the earliest, after the end of the fourth, at the latest, before the beginning of the seventh semester." If we take into consideration the regulation that "at least two semesters must elapse between the passing of the *tentamen physicum* and the admission to the state medical examination" (May 13, 1870), and that on admission to the state examination certificates must be furnished showing that the candidate has functioned as a practitioner for at least two semesters at a surgical clinic and two semesters at a medical clinic (October 27, 1860) and has observed at least four births at an obstetrical clinic (September 25, 1860), it follows automatically that in a four-year course the passing of a *tentamen physicum* constitutes a legally prescribed prerequisite to the student's attendance as a practitioner at the clinics. The fixing of this examination at a definite time is therefore equivalent to an indirect compulsion, which I do not consider necessary in principle, although it will probably result in no harm to the student.

On September 25, 1869, legal force was given to a resolution based on Paragraph 29 of the Industrial Code for the North German Federation, "that the right to grant certificates for physicians and dentists for the whole Federation is limited to the central authorities of those states in the Federation which have one or more universities within their boundaries"—a measure which greatly affected the examination system in Prussia. By this law the right to license physicians was given to the ministries of the Kingdom of Prussia (with the Universities of Berlin, Bonn, Breslau, Göttingen, Greifswald, Halle, Kiel, Königsberg, Marburg), the Kingdom of Saxony (with the University of Leipzig), the Grand Duchy of Hesse (with the University of Giessen), the Grand Duchy of Mecklenburg-Schwerin (with the University of Rostock) and the combined Ministries of the Grand Duchy of Saxe-Weimar and the Saxon Duchies (with the University of Jena).

By this regulation the former examining boards in the capitals of the individual states, such as Hanover, Cassel, Darmstadt, etc., were dissolved. The principle of state examinations was retained, but the antiquated and impractiable principle of Von Altenstein of excluding the professors, as far as possible, from the examinations was abandoned. The faculties as such were not in so many words constituted the permanent examining boards, but that is what it amounted to. For since the regulations require (Paragraph 2) that the examining boards shall consist of professional men scientifically trained in all branches of medical science, in the small university towns this practically limits eligibility to the professors and their assistants. The paragraphs that follow permit no doubt that this is the correct interpretation of the purpose of the law. Thus, for example, Paragraph 6 reads: "The examinations in anatomy, physiology and pathology must be taken before three members of the examining board who are specialists in anatomy and physiology or in pathological anatomy." The last section of Paragraph 15: "Where there is no special professor of diseases of the eye, the examination in this subject may be given by the examiner in surgery," shows beyond question that in the new regulations the framers intended the professors to be the examiners. The faculties now quite properly function as the permanent State Examining Boards.

A logical inference from these measures was that the state did not wish to compel candidates to take two similar examinations conducted by the same professor. Since, however, neither the sovereign nor the state wanted to usurp the right to grant the degree of doctor, but wished to leave this ancient privilege to the faculties, giving the title of physician and not of doctor to those who passed the state examination, it followed that the obtaining of the doctor's degree had no relation at all to the right to practise, so that under the new conditions the degree could no longer continue to be a prerequisite to the state examination. It is therefore optional even today with each physician in the German Empire to take a faculty examination before or after the state examination, to write a dissertation and graduate as "Doctor of Medicine" or not, altogether as he may choose. At present the force of tradition is still so strong that it is almost universally done. The rightful possession of the degree gives evidence of exceptional scientific achievement, or at least of the passing of a corresponding examination. The degree, to be sure, costs him some money, but it is worth it from the standpoint of social position. Thus the regulations of 1869 represent in every respect a gain for the faculties, especially for the smaller faculties, which have now regained the right to grant indirectly, as members of the state examining boards, the right to practise, in addition to the doctor's degree. I consider it of great importance to have the equality in standing of all the faculties thus legally recognized. It must gradually lead to a natural equalization of the attendance, since students are no longer compelled by all sorts of minor considerations and by special local laws to take their examinations at any one place, or to study at any specified school, but may study and take the examinations where they please. We shall now discover far more readily which universities offer the best conditions for students, although even now attendance is affected by many circumstances aside from the excellence of the teachers and the laboratories. We shall touch on these later.

The Austrian Medical Examinations.—Since it will be interesting and instructive to compare the new Austrian regulations for medical examination with those prevailing in the German Empire, and to note and criticise the relative extent of elective freedom considered desirable in the two German lands, I shall first give a short sketch of the history of the Austrian medical examinations.

The Degree and the State License.—The chief differences between Austria and Prussia in the matter of the relation between the degree and the state medical examinations date back to the reorganization of the University of Vienna and of the Austrian medical profession by Gerhard van Swieten in 1749. Until that time the decadent faculties of Vienna and Prague still had the privilege of granting the right to practise (the *venia practicandi*) together with the Master's degree. From the year 1551, when the universities became state institutions, the courses of study, the disputation and graduation were supervised by the superintendent—an office corresponding approximately to that of the modern university curator. But the courses, disputations and graduations had no influence on the examinations themselves, which since the beginning of the last century had everywhere been growing more lax and had ceased to offer the state any guaranty that really competent physicians were being trained. Whereas in Prussia this was remedied by adding, after 1725, an examination supervised by the state, in addition to the faculty examination for the degree, Gerhard van Swieten, while retaining for the faculty the function of granting the right to practise, placed in the faculty, and above it—not as teacher and colleague, but as a state official—a Director of Studies, whose duty it was strictly to supervise the conduct of courses and examinations. Under this official the dean's importance gradually diminished to such an extent that from 1780 to 1791 no dean was chosen in the medical faculty. For the medical faculty no less a person than Gerhard van Swieten himself took the post of Director of Studies, and soon after gave up his own teaching activities. From that day to this, except for the period from 1848 to 1873, the Austrian examination for doctors of medicine has been supervised by the state, being neither a faculty examination nor a state examination exclusively. In spite of his strict control over the faculty as the examining board, Gerhard van Swieten always retained the character of the university professor accustomed to academic freedom, the man of great qualities and great aims.

Although after 1554 the five- or six-year course for physicians had been prescribed in such a manner that candidates had to study philosophy and the natural sciences for three years, and the theory and practice of medicine for two or three years, Gerhard van Swieten attached little weight to these regulations. He ruled that "everyone, who, irrespective of the number of years he has spent in study at an approved university, has passed the two searching examinations, shall be given a degree. In the first examination the candidate is to be questioned on all phases of the medical sciences; in the second, on one or two of the aphorisms of Hippocrates. The chairman (the Director of Studies), the dean, four professors, and two doctors chosen by lot out of twelve named by Her Majesty, must attend the examinations. The doctor's degree obtained at Vienna is valid for the entire empire; that of the other universities only for the province in which the university is located. The examinations for surgeons are to be given by the chairman, the dean and two professors of surgery and anatomy, with the assistance of two other surgeons."

Graduation.—The graduation exercises, whose costliness and solemnity Van Swieten somewhat modified, had been since the founding of the university a faculty affair. He now made them a university function by drawing into them the rector and the chancellor.

Introduced with extraordinary speed and efficiency, these institutions were violently attacked by the old faculty and the College of Physicians and Surgeons; but so firmly entrenched was Van Swieten in the good graces of his Empress that he was not in the least affected. Never before or since has such a degree of academic freedom—of freedom to study and to teach—existed at the medical school of the University of Vienna. Van Swieten believed that university study should be co-extensive with the idea of freedom, and that in the control of the professional examination the state had enough power to prevent ignorant persons from becoming physicians, lawyers and teachers, a view which is shared even now by many of the most distinguished professors in Austria and the German Empire.

A general reorganization of the program of courses and examinations of 1749 was undertaken in 1774; not all the faculties were equally satisfied with the scientific and practical results of the Van Swieten system. But this change did not materially affect the medical faculty. Discipline seems to have become slightly more strict, and the five-year course was made obligatory.

Joseph II.—Even with these modifications there was soon dissatisfaction. When Emperor Joseph II began to rule independently in 1780, it was his dearest wish to impart to Austria, and especially to Vienna, through native resources, the same scientific and intellectual glory of which Paris could boast, and which Berlin had gained by attracting French talent. At the same time, however, he wished to see enlightenment and culture develop as quickly as possible and penetrate every stratum of the population; it was his hope that popular, useful and academic science might flourish simultaneously and speedily. But Joseph II and his advisers were under the illusion that all that was needed to attain these ends was proper organization, overlooking the fact that at that time the people were neither politically nor culturally ripe for such things. Where academic philosophical work was given free rein, it not only did not bear any immediate fruit but it insidiously attacked the bonds by which human society was being held together. It became dangerous to the state (e.g., Voltaire, Rousseau) because for the time being no new positive and constructive ideas were offered in place of what had been discarded. And though we were careful to change our schools into hot-houses with many different departments and temperatures, in order that all sorts of erudition might grow in them, we yet deceived ourselves only too often in the artificial selection of the young shoots; or we sapped the strength of our young oaks under the glass roofs of our hot-houses, with the result that those which survived to a certain age remained puny and unfruitful when they were placed in the open.

It was impossible to get rid of the notion that the creation and education of intelligence was above all things a matter of form, a conception that even today dominates the French and English nations. By this Roman Catholic principle the minds of men have been formed and controlled for centuries. That new ideas in science and art can develop freely only when they are permitted, like young mountain streams, to seek their own courses, to create their own forms of expression and representation, was not and could not be admitted. It has always been and will always remain true that no generation can form a clear idea of what would become of human society if the forms to which that generation has through education and tradition become accustomed should fall into ruin. Most old people die under the impression that human society is going to ruin; only a very few are given the prophetic vision to see in their old age whether the trend of culture is upward or downward.

Joseph II desired to kindle a fire that should not only diffuse warmth and a gentle glow of light, but that here and there should flare up and generate soaring rockets, which should hover over Vienna like comets, and should draw the admiring gaze of the world, not only to their light but also to their source. But his counsellors did not bring to pass what he desired; indeed, the fire risk became increasingly alarming when France, after the release of her inflammable intellectual elements, burst into flames. Thus it was that gradually the gentlest glow of fire was quenched, and somewhat later even the fire of cigars and pipes was supervised with anxious care.

Interesting as it would be to elucidate what I have just said by quoting the very precise orders which were often dictated by Emperor Joseph himself, yet it would require too long a digression from our historical sketch of the development of academic freedom and of the medical examinations in Austria. The man whom the Emperor chose to carry out his plans, Gottfried van Swieten (the bodily but not the intellectual son of Gerhard van Swieten), was not able to grasp and formulate the ideas of his exalted ruler. Although himself a so-called freethinker, and according to Kink's not entirely impartial picture a cynic at heart, but absolutely devoid of intellectual inspiration, he introduced nothing new except increasingly restrictive forms and methods for the mechanical training of the mind. Either the men who were to be both brilliant scholars and practical teachers were not available, or he did not know how to find them. How utterly unintelligible to him was the union of a free academic spirit with the education of citizens, appears from his adverse judgment on the then flourishing University of Göttingen, to which Emperor Joseph's attention was drawn by some other person.

The training of future citizens who were to be educated usefully and scientifically began by clamping on teachers and students a suit of armor, in the form of a mechanism that regulated their every move. On January 20, 1783, it was ordered that no professor be permitted to make the slightest change or addition in the textbooks prescribed, without the permission of the Court Commission of Education. On September 7, 1784, came the order that the examinations were to be taken after each semester, before the Director of Studies and the teachers concerned, that the students were to be divided into classes, and that promotion into the higher classes was to be dependent on success in these examinations.

The Emperor was, above all, interested in quick results. He ordered: "That the number of those learning to read and write must be as great as possible, and the number of those attending higher courses must be smaller. Only men of marked talent are to be admitted to the university courses." He desired at the university not extensive, but intensive education, and speed. The Universities of Innsbruck, Brünn and Freiburg were therefore abolished and changed into lycées with medico-surgical schools. Everything was to be concentrated at the Universities of Vienna, Prague and Lemberg, and quickly! All study courses were shortened by the prescription of a rigid progression, and lectures were to be delivered in German. Van Swieten opposed the reduction of the number of professors and of the time for the medico-surgical course by referring to the excellent results of the school at Leyden, on which the Viennese school was modelled. Then Emperor Joseph himself drew up a curriculum for medical and surgical students. The document (Imperial rescript of April 27, 1786) is so interesting and original that I shall quote it here in full:

> "Little versed as I am in the field of medicine (and I am even less inclined to criticise the former School of Leyden and the medical and surgical course organized here by the late Baron Swieten), certain contradictions are evident to me, and I am sure that improvements could be made in the course of study introduced under this faculty, as has been done in most of the others. It is first of all asserted that the study of anatomy and physiology, the first of which contains the descriptions of the parts of the body, and the latter the resulting movements and functions, cannot be taught by one professor, because he could not do justice to them, and could not in one year complete anatomy and physiology without both morning and afternoon lectures; and further on it is asserted that the professor of surgery can teach the necessary surgery and anatomy quite comfortably in one year. How these two statements are to be reconciled I do not understand, even less so, since the surgeon, who works on the human body with saw and knife, ought to know its parts more thoroughly than the physician, who entrusts all his cures to pills and powders taken into the stomach. That physiology does not take up the whole time of a professor is proved, since he is expected to teach materia medica, which is in no way connected with that subject. It is claimed that the two separate practical and clinical courses at the bedside should be kept separate, for the reason that one of them deals with the general diseases in the towns and rural districts, and the other with the more complicated ailments of the cities. Do diseases respect this division between rural and urban, and may not the peasant fall sick of a noble's disease, and the noble of a peasant's disease? I am not convinced on this subject, especially since in regard to surgery the serious accidents are more frequent and more severe in the country than in the city, the same being true of long-neglected diseases. But even if this were to be left an open question, I still do not understand what harm would be done if the rural surgeon were taught all that is now reserved for the "medicos." With this in mind I have by preference chosen the German language; and the length of the course can be shortened, for it does not seem necessary to me that the rural surgeons learn botany, chemistry and theory, if only they have a command of the practical side of medicine and surgery and obstetrical assistance. It does not seem possible to me to teach surgery and bandaging adequately in six months; and I am dividing the study of medicine as follows: In the first year, anatomy combined with physiology in such a way that when, for example, the lung is shown in anatomy, its use and function in the healthy body is at the same time explained; and so on to the last muscle in the body and its use. Both physicians and surgeons must complete this year. The professor of anatomy and physiology must be provided with the necessary prosectors, and with whatever he may need to do justice to his task. At the same time botany and chemistry should

be taught the medical student in the first year, and operations, bandages and obstetrics should be given to the surgeons.

"In the second year, surgeons should learn surgical and medical practice and clinic in the hospital, and get their obstetrical practice also in the hospital, which would finish their required work; but the medical students should be required to take courses in materia medica, pathology and all that is needed for the learned profession of medicine; in the third year, they should devote themselves entirely to the clinic and to practical work including practice in the hospital. In this way, skilled surgeons would be trained for the country districts in two years, and physicians for the city in three years. I await the further development of this plan in the direction indicated. "Joseph."

The Commission of Education, under the chairmanship of Gottfried van Swieten, did oppose this abbreviated "All-highest" medical curriculum most energetically. Joseph even calls the counter-proposition "strong and learned" and would be inclined "in the ignorance to which he must confess concerning medical science, to agree to it," but he could not get rid of the idea that at the university the education of surgeons and physicians could be completed with one staff of professsors, and that the difference between the courses need be merely quantitative, not qualitative. He does not seem entirely convinced, however, of his own "ignorance in medical science," for he goes into all the details again, although making a few concessions. The end of this section of the order, in which he himself organizes the faculty (it related primarily to the University of Lemberg, which was to contain all the faculties, but it was nevertheless meant to enunciate a general principle), reads as follows:

"The physician, after completing the study of physiology, combined with higher anatomy, should be separated from the surgeon; in the first year he should learn botany and chemistry, in the second year materia medica, combined with pathology, because it is incomprehensible to me how fever can be explained without at the same time speaking of salts and quinine, which are destined to cure them, and again to talk of salts and quinine without speaking of fevers; how antiseptics can be taught without speaking of putrefactive bodies, and again how putrefactions can be dealt with, without mentioning antiseptics. This must be true of all diseases if materia medica is separated from pathology. The uniting of these two subjects under one professor will be the easier since each of these subjects now occupies only half of the time of a professor. When, therefore, these two subjects are combined, one man can easily handle the work, and the professor who now teaches pathology will be at the same time professor of practice. He could simply give his lectures at the clinic and the sickbed, giving practical instruction in both materia medica and pathology. This professor can in future devote two hours daily, which he now uses for both his lecture and his clinic, entirely to his clinic, and can divide them in such a way as to cover in the first hour the common diseases with the rural surgeons and the surgeons proper, and then use the second for the medical students who are going into the learned profession. In this second hour he will also have time to expound all the different methods. Accordingly, every university would need seven professors in all for the study of medicine and surgery, as follows:

"1. A professor for both medical and surgical students, on the structure of the human body, for the beginners, who shall also give the lectures on obstetrics in the second half of the year.

"2. A professor of physiology and anatomy for medical and surgical students.

"3. A professor of surgery, materia medica, pathology, of herbs and of lower chemistry for the surgeons.

"4. A professor of operations, bandaging and instruments, who should also give practical instruction in surgery.

"5. A professor of clinical medicine, for both medical and surgical students. The medical students would have, besides those that were in common—

"6. A professor of botany and chemistry, and

"7. A professor of materia medica for themselves alone.

"In this way I believe that the whole matter could be practically and usefully arranged, although not having sufficient confidence in my own knowledge of the subject, I shall await further instruction from you. A surgeon and a rural surgical practitioner would be graduated in two and a half years, and a physician in three and a half years, even with such repetition of courses as might be found necessary.

"Joseph."

The Emperor yielded to renewed representations to the extent that four years were allowed for the combined study of medicine and higher surgery, and two years for city and rural surgeons.

Even today several peculiar traditional vagaries in the combination of subjects and the arrangements of the schedule of classes at the Austrian universities can be traced to this imperial plan of study.

It must have been a bitter pill for the Emperor, who was aiming very high, to discover that the curriculum created by himself bore no fruit, and that furthermore, both at home and abroad, there were unfavorable comments upon it. There is no more biting criticism of Joseph's course of study than one from his own pen. The imperial resolution of February 8, 1790, eleven days before his death, betrays a nervous, feverish tone in its terms; everything that he had himself ordered he now criticised most bitterly as ineffective. I can visualize him, walking up and down in his room, highly excited, dictating rapidly. The document itself is not before me; but the report which Gottfried van Swieten's successor, Martini, made to Emperor Joseph's brother and successor, the Emperor Leopold, on June 24, 1790, quotes in the Emperor's own words the following points, as having been especially criticized by Joseph:

1. The subjects are piled on too heavily, and the students are compelled to study, together with the regular and essential subjects, many subsidiary sciences which are not necessary for the future professions of all of them.
2. Several teachers have no text-books for their courses; instead, they burden their students with the shameful and injurious copying or dictation of their oral lectures. (sic!)
3. In the lectures little emphasis is given to thoroughness, and the teachers are content with a superficial knowledge of their science. Everything therefore ends in useless words and in mere memorizing.
4. Too much time is wasted by the two examinations at the end of the half-year courses, and at the same time the diplomas, on which the division of the fees depends, are not issued by the teachers with the necessary conscientious impartiality.
5. The study and the use of the Latin language has been almost entirely neglected.
6. The academic religious services are being omitted entirely, and several teachers are so bold and immodest as to make objectionable remarks in the presence of the students against the pure teaching of Christianity, to the annoyance of all.
7. For this reason looseness of morals and contempt for religion have gained the upper hand among the students, and school discipline has gone by the board.

All this was now to be remedied quickly! Quickly! He probably felt that haste was needed if he was to live to see the change. Going over the heads of Van Swieten and Sonnenfels—concerning whose ability he had become doubtful in the preceding few years—he assigned to the highest chancellor, Count von Kolowrat, the task of setting up a special commission which was to change the educational systems in all higher branches of learning as speedily as possible, so that the results could be applied in the very next school year. But before even the first steps toward the execution of this order could be taken, death overtook the Emperor. After a restless activity of scarcely ten years, distinguished by unexampled exertion he was fated at the end of his days to drain the bitter cup of disappointment, and to admit to himself that everything that he had sought to accomplish, impelled though he was by noble impulses and seductive ideas, had failed, either because he was wrong in his purposes or because the methods employed were at fault.

For me there is something touching and tragic in this Emperor Joseph. Visionary idealism seeking a practical form! The faults of his virtues lead him into conflict with himself. Where is the dramatic poet who can grasp this figure? Here is indeed a task worthy of artistic effort. Not many such warm-hearted and altogether human beings have occupied the thrones of this world.

Martini's Reforms.—From the curricular reforms sanctioned by Emperor Leopold on October 4, 1790, I shall quote according to Kink such passages as relate to the freedom of study and teaching. "It was Martini's chief aim to raise the standing of the teaching profession. The position of Director of Studies was to be abolished, and academic affairs were to be put into the hands of the teachers, even if they had only advisory powers. But we can see from the manner in which this was carried out, how, out of past experience, the fear of arbitrary faculty action was always before his eyes. For, on the one hand, the arrangement which he proposed was undeniably too complicated, and on the other hand, he was anxiously concerned with limiting the sphere of action of the individual professors in two ways: first by prescribing a text-book, and then by a special definition of their official duties. The professors of each faculty, of the *Gymnasium,* and of the normal schools, were each to form a Teachers' Council; from every Teachers' Council one person was to be chosen, and those chosen were to form a Committee on Curriculum, under the chairmanship of the rector. The jurisdiction of the Teachers' Council was to extend only over the institution in question, while the Committee on Curriculum had jurisdiction over the whole province. Any person who was a member of the Committee on Curriculum had to step out of the Teachers' Council. In order to stimulate the scientific spirit, every teacher was to be held responsible for printing two essays each year. The students were to have permanent seats assigned to them in their classes, and from time to time their seat numbers were to be changed to prevent the formation of student organizations. The examinations at the end of the semester were to be dropped, and shorter examinations given through the year were to take their place. The examinations at the end of the year were to be checked by examinations given by the Chairman of the Committee on Curriculum. No changes were made in the content of courses, in the division of subjects, or in the choice of text-books."

What a complicated mechanism! It broke down now here, now there. The desired results, the scientific glory which was to be spread by Austrians from Vienna over all Europe, did not materialize. In 1802 the Directors of Studies were again introduced, and were provided with even greater powers and instructions than before. Teaching and study became more and more narrowly restricted. In 1804 a new program of courses for the study of medicine and surgery was issued, which again extended the course to five years. This curriculum was expanded in 1810, and still further in 1833.

Metternich.—It might seem impossible, judging from the foregoing, that academic compulsion could go further; yet precisely this occurred under Metternich's régime. In later days, there remained scarcely five minutes in the whole course when either teachers or students could reflect freely on what they had heard or seen; and if, in spite of all precautions, one of them should find time for reflection, he was drawn back promptly into the path of dogma by the incessant examinations. Without a study of the orders of that time, our generation will not be able to grasp these conditions.

In order to gain the various degrees the following courses were prescribed by law:

I. The Higher Course of Study in Medicine and Surgery:—Entrance requirement: the graduation diploma of a *Gymnasium;* a five-year course at one of the universities of Vienna, Prague, Padua, Pavia, and for military surgeons, at the Joseph Academy at Vienna. First year: encyclopedia and special natural history, anatomy, botany. Second year: advanced anatomy and physiology, general and pharmaceutical chemistry. Third year: general pathology and therapy, pharmacology and pharmacognosy, the art of prescribing, dietetics, obstetrical theory, epidemics and diseases of domestic animals. Fourth year: special pathology and therapy, special surgery, operating (theory and practice), medical and surgical clinic. Fifth year: continuation of all courses of the fourth year; in addition, diseases of the eye, and eye clinic, medical jurisprudence, with post-mortem examinations, and public sanitation.

Anyone who wished to become only a doctor of medicine did not have to attend the courses on surgery, the surgical clinic or the course on operations in the fifth year. For doctors of medicine and surgery all the courses were prescribed.

If the candidate had passed the five-year course, including all the semestral examinations, he had to apply to the Director of Studies for admission to the faculty examinations (*rigorosa*), presenting at the same time his certificates and two case histories. The examination for the degree of Doctor of Medicine was conducted by the chairman (the Director of Studies), the dean, the professors of the examination subjects, and a so-called visiting examiner from among the practising physicians. In Vienna the latter was always replaced by the Assistant Director of Studies.

In the *Rigorosum Med. I.*, examinations were given in anatomy, botany, physiology, general and special pathology of internal and external diseases, semeiotics and general therapy. The second medical *rigorosum* included chemistry, medical jurisprudence and public health, materia medica and prescribing, and practice at the sick-bed. After this the candidate had to hand in his dissertation and was then admitted to the disputation, which was followed by the formal granting of the degree. He was what at that time was called in Prussia a *medicus purus.*

Formerly it was possible to become a doctor of surgery without having been graduated as a doctor of medicine. For the degree in surgery the same course of studies given above was required and then the following examinations:—*Rigorosum Chirurgiae I:* anatomy, chemistry, materia medica, and prescribing, medical jurisprudence, theory and practice of surgery; *Rigorosum Chirurgiae II:* a surgical operation and an eye operation on the cadaver with a lecture on the history of the case, the indications, etc., the application of bandages. Dissertation and a disputation as in the case of the doctor of medicine. Not until the decree of October 8, 1843, was the degree of Doctor of Medicine made a prerequisite to that of surgery.

I shall pass over the modifications of the program of examinations for those cases where a Doctor of Medicine wished to become a Doctor of Surgery, or vice versa, after the first degree had been obtained.

II. The Degree of Master of Surgery:—A degree corresponding to the old Prussian grade of surgeon of the first class.

The requirements for eligibility were: Certificate of completion of the sixth class of the *Gymnasium;* study for the first and second year at a medico-surgical school, according to the plan outlined below (Plan III); in the third year, study at a university, covering the third year of the higher course in medicine and surgery; special certificate proving the passing of a term examination in the use of instruments and in bandaging. Examinations: *Rigorosum pro magisterio chirurgiae I:* anatomy, theoretical and practical surgery, medical jurisprudence, theoretical and practical medicine. *II:* post-mortem examination and surgical operation. Diploma, no dissertation, disputation or formal graduation.

The degrees so far mentioned could be gained and the studies completed only at a university. Since there were at the time only two university faculties in German-Austria that gave courses for physicians (Vienna and Prague) this rule resulted in practically the same conditions that prevailed in Prussia, where the examinations could be taken only at Berlin. It is evident that this would have resulted in even much greater overcrowding of the Universities of Vienna and Prague than was already the case, if the study of the lower branches of medicine had not been in the hands of the medico-surgical schools. As pointed out before, it was not necessary, as was the case at that time in Prussia, to establish such schools, since they already existed in those cities where there had formerly been universities, in Salzburg, Olmütz, Lemberg, Laibach and Innsbruck. The faculties of these institutions were much reduced and at times even abolished; reduced universities of this sort were called "lyceums." But the same courses of study for lower surgery were also available at Vienna (at the University and at the Joseph Academy), Prague, Pavia and Padua.

III. Medico-surgical Training for City and Country Lay Surgeons:—The eligibility requirements were: Certificates of completion of the fourth class of a *Gymnasium* or of a school of equivalent standing; certificate of completion of a three-year apprenticeship to a surgeon in a city, regular articles of apprenticeship and a formal certification. A person who could not produce these, but who began to study as soon as he had left school, had to serve for three months in a hospital at the end of his course before he could be admitted to the examinations. Then he had to furnish a special certificate testifying to his skill in the use of instruments and in the art of bandaging. The course, which covered three years and could be taken at a lyceum as well as at a university, was arranged as follows: First year: Introduction to the study of surgery, physics, chemistry, botany, anatomy, dissection. Second year: Physiology, general pathology and surgery, materia medica, pharmacognosy, theory of obstetrics, veterinary surgery and medicine. Third year: Special pathology, medical jurisprudence, special surgery, the use of instruments and bandaging, operations, ophthalmology, operating practice, medical and surgical clinic.

Instruction in these courses was in German, as long as they continued to exist. At the universities it was in Latin down to the time of the edict of Emperor Joseph in 1782, according to which instruction at the universities had likewise to be carried on in German. In the reign of Emperor Leopold II instruction in Latin was reintroduced into the universities, especially in the medical clinics; this was continued almost down to 1848.

At the examination for "middle-class" and country surgeons (surgeons of the second class according to the Prussian classification) which was conducted by the faculty of each school, and by the dean and the chairman, the candidate was examined in anatomy, theoretical and practical surgery, theoretical and practical medicine, and medical jurisprudence.

The "magisterium" and the "patronate" of surgery were (just as in Prussia) not lower steps in the doctor's career, but lower categories outside the medical profession. The amount of preparation required and the course of study were so different that it was practically impossible to advance to the doctor's degree except by beginning all over again.

Every one of the physicians and surgeons included in one of above-mentioned categories could take the examination as obstetrician; to this end he had to engage in practical work for two months at an obstetrical clinic. Obstetrical clinics of this sort existed at all lyceums and universities.

Only doctors of medicine and doctors or masters of surgery were eligible for the examination for "master of ophthalmology," which was taken by few. This examination was given only at a university.

The Operator's Institute.—I cannot close my account of this period of Austrian, and more particularly of Viennese conditions, without mentioning the Operator's Institute founded in 1807 by Emperor Francis. At the instigation especially of Vincent von Kern, who had the energetic support of the then all-powerful Director of Studies, Baron von Stift, an institution for training young surgeons to become operators was established in connection with the surgical clinic at Vienna. In order to enter, the students had to be *"patroni chirurgiae"* or doctors of medicine. The competitive examination for admission consisted of an examination in topographical anatomy. Then these students received courses for a year in the theory and practice of operations from the director of the Institute, who was always the director of the clinic. They then had to pass an examination in operations on the cadaver, after which the director permitted them to operate on patients in the clinic. At the end of the second year they had to take their examinations for the degrees of Master or Doctor of Surgery, and on passing this they received a special diploma as "operator." This diploma gave them special privileges in the form of preference in the filling of various posts, and aided the advancement of those physicians who entered the military service.

Emperor Francis created six scholarships for the Institute, each with an annual stipend of 300 gulden and free quarters in the hospital, a provision which at that time was sufficient to support the holder. In 1815 the Duchy of Styria created two such scholarships; in 1821 the administration of Milan two; in 1833 Transylvania one; and in 1839 the Tyrol one, with corresponding stipends.

In the course of time this Institute underwent many changes, which I wish to note here. When two surgical clinics were organized the two clinical directors divided the students between them and became co-directors of the Operator's Institute. The courses in the theory of operations were no longer given for the operators alone but for all students. In 1848 entrants were required to be at least "Masters of Surgery," a condition which arose from the fact that no more "patroni" were being created. When the degree of Master of Surgery fell into disuse, it followed automatically that entrants had to be at least Doctors of Medicine. In 1870 came the new order that only Doctors of Medicine and Surgery would be admitted. This, too, was the result of new conditions.

In 1850 the free quarters in the hospital were abolished and a small additional allowance was substituted. In the same year students without scholarships were admitted. The examinations at the close of the first year were dropped after the establishment of the semestral examinations in 1848.

These were the conditions that I found at Vienna in 1867. At first I could not become accustomed to them. It had been my custom at Zurich to associate much more directly with the students, and to let them operate at the clinic after I had become acquainted with their abilities in the course on operating, while here I was compelled to let only the operators perform operations. Moreover, lectures on the theory of operating have always been distasteful to me, for I am of the opinion that the theory of operating is a part of surgical therapy, and belongs in the courses on special surgery and in the clinic, in which instruments and bandages are demonstrated. To teach purely technical matters formally from the lecture platform seems to me to be futile. For this purpose we have courses in operating and bandaging, and the student ought to take as many of them as possible. At Vienna these courses have for some time been chiefly in the hands of assistants. I soon became convinced that with an average of 250 students in each semester, I could not give a course in operating to all of them, though in such case it is obviously difficult to make a selection. In view of the rapid growth of the dispensary, clinical instruction and practical examinations require on the average three hours of my time daily; and a professor cannot, surely, be expected to give more time than that. I was therefore compelled to abandon the idea of giving all my students practical training in surgery, and presently arrived at the conviction that the Operator's Institute was, after all, well adapted to the local conditions. At least these few men could be given a thorough practical training. I sought, however, not to limit their education to the field of operative technic, but to extend it over general practical and scientific surgery. I therefore added to their clinical duties, giving them charge of the records of the case histories, offering them from time to time special operative instruction and allowing them to participate in experimental and microscopic research in my private laboratory. In this way the assistants were to some extent released from the drudgery of dressing wounds and gained more time for scientific work. Above all things I was intent upon restoring, through medical publications, the almost severed bonds between German and Austrian surgery. I hope that this union has already been accomplished, and that it will continue to the satisfaction of all concerned.

Then, too, I was interested in giving the benefits of these posts to as many individuals as possible. I tried to divest the positions of every advantage, with the exception of the stipend, and of every subordinate purpose, in order to obtain wherever possible only those students who sought scholarships solely for the sake of the scientific training they afforded. It has been frequently pointed out that it was unfair to distinguish the few who had the good fortune to study at the Institute by giving them special diplomas. A young surgeon could attain the same degree of experience at a surgical clinic of another faculty, or as assistant at another clinic or ward, as did the pupils at the Operator's Institute. He would not, however, receive the Operator's diploma and the advantages that went with it. In view of the limited field in surgery, the diploma implied far too great a discrimination in favor of the holder.

Occasionally one of the students proved at the end of a year not to be fitted for surgery. Under the rules he had to remain a second year, keeping a more talented man out of his place. Finally, it seemed to me desirable to keep those students whom I thought fit for a scholarship, as assistants at the clinic, until a vacancy should occur at the Institute.

These were the considerations which prompted me, in conjunction with my colleague, Von Dumreicher, to propose a reform that was adopted by order of the Minister of Education on August 23, 1870. The essential changes were as follows: The scholarships were to be filled for terms of one year, and these terms might be extended to three years at the request of the directors. At each clinic there were to be not more than eight students at one time. The diploma was dropped, but the director could furnish, on request, a personal testimonial. Since the term "operator" is unintelligible to the reader of medical literature in the German Empire, I describe the students of the "Operator's Institute" as "assistants," in contradistinction to which the two clinical assistants describe themselves in their publications as "assistant physicians."

Since the changes of 1832, no entirely new program of examinations had been formulated by the medical faculties of Austria until 1872, but conferences looking toward a new regulation were in progress continuously after 1847.

The Revolution of 1848.—The year 1848, however, so completely demolished the university constitution and the curricula of the faculties, that the examinations of 1833 bear little resemblance to those conducted between 1849 and 1872. The attack came from two sides; on the one hand, from the fighters and shouters for academic freedom, and on the other, from the members of the conservative College of Physicians, who, ever since Gerhard van Swieten had swept away the ancient privileges of the faculty, had often raised their bewigged heads in anger. While Vienna was still in a state of siege, a clever ultramontane minister of Bohemian extraction promulgated a law, cautiously called "provisional," concerning the organization of academic authorities (September 30, 1849), and a general educational program (October 1, 1849), an ordinance which, compared with the more conservative and aristocratic forms of the other German universities, shows a decidedly bright red shade of democracy. The "liberated" wanted to prove that they were even freer than the free, with the result that in the organization of its faculties the University of Vienna suffers even today from the excesses of that period. The Austrian body politic is not merely tinged with the yellow and black of the monarchy; it is black and yellow through and through. In the days of 1848 it was given a thin coat of red or of black-red-gold republicanism. But these colors will not wash; they are bound to fade sooner or later, and the rain washes them away. You may take your Austria and cut it in two; or you may compress it, or expand it, or grind it up as you will; but you will find in the end that every square millimeter of the residuum will show the yellow-black colors of the monarchy. It is very interesting to note how the best men in Austria often underrate their own power of endurance, and to observe their ungrounded fear of their own dissolution. The chemical that could dissolve this substance has not yet been found; and if it were found, a yellow-black precipitate would forever crystallize out of it. It is a peculiar fact that the toughness, the cultural significance, and political strength and necessity of Austria are far better recognized and far more highly valued in the German Empire than among Austrians themselves. In the German Empire there is more reverence for the historical significance, and especially for the cultural importance, of this great power than the subjects of the East German imperial state themselves seem to possess.

Superficial observers are often deceived by the fact that in the essentially hyperconservative Austrian character there is at the same time the inclination to assume, outwardly, the most varied colorings, and that the most violent contrasts seem to be the most popular. Many phenomena in the political and social life of Austria, especially in Vienna, must not be taken as seriously as at first glance they seem to be. For example, when we read in Section V of the General Regulations of 1850, Paragraph 44, that: "Although they must be prepared to meet the requirements for the state examination and for the examinations for the degree, the students are in general free to choose which courses they wish to attend, and under which teacher," one might take it to mean that the student is free to attend classes or not, as he chooses. We can imagine what an impression such a rule must have made on a generation that had been reared in an intellectual strait-jacket, with dark spectacles before their eyes and cotton-wool in their ears. The young people turned somersaults in the grass, and the old men, whose bodies had been hindered in their natural development by the lifelong burden of state supervision, felt their world tumbling about their ears, and believed that the end of things was at hand. But the somersaulters were the victors and so they had their way. Yet the old men found means of putting little hooks into the newly erected tents, and of driving stakes into the ground by means of which the new, airy dwellings were kept from flying away when storms arose. Such a hook, for example, was the word "in general" in the paragraph quoted above, from which the ministerial order of July 5, 1851 quite wisely took its cue, providing that freedom of study could and must be limited, not only by positive state provisions, but also "by the natural sequence of the subjects, in so far as this sequence is evident, and so obvious that only lack of common sense can ignore it." Since every objector to this rule was thus officially, and in advance, described as an idiot, the inclination to oppose it was not very great. But even in the General Regulations quoted above, certain limitations were stated. In Paragraph 47, a five-year course was demanded for medical students, of which two years were to be spent at an

Austrian university (Paragraph 48). In former days, study at non-Austrian universities had been absolutely forbidden. In every semester the student had to carry a program of at least ten hours, not counting laboratory work. Private study without attendance at public lectures was not recognized, and did not entitle the student to admission to the examinations (Paragraph 50). The decision of the professors of Prague, prohibiting students from attending clinics before they had produced evidence of having attended courses in anatomy, physiology, pathological anatomy, chemistry and pharmacology, was ratified by the ministerial order of January 25, 1858. The medical professors of Vienna were informed of this action, in case they might wish to introduce a similar procedure, but they did not act in the matter.

From all this it is evident that freedom of study was still far greater at Vienna than at the other universities of the German type, but was nevertheless subject to certain reasonable restrictions. To this must be added the fact that after the abolition of the term examinations the final examinations were made even more severe. The professors of anatomy and physiology were especially responsible for this stiffening of the final test, and deserve great credit for improving the scientific training of the Viennese physicians. For their pains they were most bitterly attacked, and until very recently were often accused of being "fee hunters," even from the floor of parliament.

Unhampered teaching is a great joy; it is a necessity to everyone who is filled with the scientific spirit and knows his subject. But examining is a torture. A man needs the spirit of self-sacrifice, and a natural inclination to dogmatism—which is growing constantly more rare—to nerve himself for the rôle of a stern examiner. These examiners, who give their services to the state because of their conviction of the social necessity of a rigid examination, ought to be especially honored, instead of being showered with invectives.

The liberals had accomplished very much in bringing about the adoption of their curriculum, but the conservatives could also be content with their successes. The bond between the Doctors' Association and the teaching body (the professors) had never been legally dissolved, although the connection was very slight. At most of the old German universities these doctors' faculties had at one time existed, but like the "nationalities" they had early been dissolved, or else they had never become such close corporations as at Vienna and Prague. At all events, they had continued to exist and to play a part in the political and national party conflicts in other towns as well. Under the University law of 1849 the doctors' faculties were recognized as separate organizations co-ordinate with the faculties of professors, and possessing their own representative constitution. The two bodies, together with the students, formed the "faculty." The dean of the faculty of doctors sat with the faculty of professors, next to the dean of the professors, with the right to vote. He had a seat in the senate, and the right to participate in all parts of the examinations. It was his duty to vote on every candidate examined by him. Two other members of the faculty of doctors were added to the examiners as "visiting examiners." (This was another old privilege of the doctors, which until this time had been delegated to the Assistant Director of Studies.) The dean of the doctors, in formal state uniform with the chain, was present at the commencement exercises. By a ministerial order of August 2, 1848, the dissertation and the disputation were abolished as prerequisites for the degree, this being the first breach in the ancient structure. Only the formal commencement and the diploma were left.

What most changed the examinations and the method of study, however, was the disappearance of the study of lower surgery. The decree in question (August 13, 1848) reads as follows: "Experience has shown that the study of the lower branches of medical science is no longer in keeping with modern conditions. The Ministry of Public Instruction therefore orders the abolition of the lower study of medicine on principle." There still remained the following degrees: Doctor of Medicine, Doctor of Surgery (which could be attained only by Doctors of Medicine), Master of Obstetrics (to obtain which the candidate had to be a Doctor of Medicine). Since 1848 these three degrees have been taken by nearly all graduating physicians. Where this was not the case, lack of money was usually responsible. The "magisterium" of ophthalmology fell into disuse, although it was not abolished. No material changes were made in the examinations of dentists and midwives. After 1869 all examinations were conducted publicly.

As early as 1849 it was determined to formulate a new order of examinations to fit the new program of studies, but none of the many plans was ever carried out. Epidemic changes in the ministry, the growing custom of perpetuating "provisional" regulations in all possible branches of the administration, and vacillation between the principles of examinations by the state and examinations by the faculty, prevented definite action being taken.

At last, on April 15, 1872, the new program of examinations was issued for the universities of Vienna, Prague, Innsbruck, Gratz and Cracow (in Austrian Poland). These new examinations are again given by the faculty under state supervision. Austria has, therefore, returned to the old guardianship principle of Metternich and Stift, after leaving the examinations from 1849 to 1872 in the hands of the faculty, without any control on the part of the state. Government commissioners have taken the place of the Directors of Studies in the conduct of the examinations. In my opinion these rather external questions of the examination regulations have recently, like the slogan of academic freedom, been thrust far too much into the foreground. Much more important, it seems to me, is the principle now established in Germany as well as in Austria, that the teacher is also to act as the examiner.[1]

Standards in Various Countries.—The difficulty of an examination depends on the number of subjects it covers, and on the strictness with which it is carried on. This last point eludes all *a priori* judgment. It is possible, under very simple, brief regulations and with only a few subjects, to set a very difficult examination; while a very easy examination may be given under very complicated regulations covering many subjects.

The method of drawing examination questions by lot is challenged by most of the younger examiners, who hold that it is too stereotyped and causes the students to limit their preparation simply to the stock questions. To some extent they are right in this; but the older and more experienced an examiner becomes, the more firmly he is convinced that up to a certain point systematized study and knowledge are necessary, if the standards by which applicants are to be judged are to be maintained as nearly uniform as possible. That this method is more convenient for examiners and candidates need not be demonstrated, nor yet that the examiner will always find opportunities for digressions, if he so desires.

In content and extent, the examination for the German Empire seems to be the most difficult. The rules for its duration are the most clearly defined. Each division of the examination takes place before two examiners, and is therefore always a double examination.

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[1] A comparison between the Austrian examination and that in the German Empire will be found in the Appendix.

Next in difficulty is the examination of the Swiss concordat. Then follows the Russian examination, and finally the Austrian. The last seems to be the easiest because it confers not only the right to practise, but the doctor's degree as well. On the other hand, the Austrian examination is made more difficult by the fact that it requires a five-year medical course, as in Russia. In the German Empire only a four-year course is required, and in Switzerland nothing is said about the length of the medical course as a requirement to admission to the concordat examination. On the other hand, there are certain compulsory courses in Switzerland; indeed, so numerous are these, that they cannot be covered in less than four years. But even these compulsory courses are not sufficient to give the student all that he needs for the concordat examination, for the subjects included in it are even more numerous than the required courses.

Thus it appears that absolute freedom of election for those who wish to obtain the right to practise exists in no country where there are universities of the German type. There are restrictions everywhere, either by means of fixing a definite time for the course of study (the quadrenninum in the German Empire, and the quinquennium with the required ten hours per semester in Austria) and by requiring several courses (dissection and clinics in Austria, and clinics in the German Empire), or by requiring so many courses that the entire course of study is thereby indirectly prolonged (as in Switzerland).

There are nowhere any definite rules governing the order in which the subjects are to be taken. In the German Empire attendance at the clinics depends indirectly on passing the *tentamen physicum,* and at Prague on the ratings received in the subjects covered in a similar examination. At Vienna, Gratz, Innsbruck there is no restriction on the order of studies, nor do I think it particularly necessary to introduce any such order, since the course will arrange itself almost automatically. Most students find it convenient to take the preliminary examinations in the natural sciences at the end of the first or second year, and the first professional examination at the end of the fourth year. To be sure, this somewhat interferes with attendance at the clinics in the seventh semester, since unfortunately the students are not all sufficiently industrious to be able to take the first *Rigorosum* without special preparation. They therefore use it as an excuse to attend no lectures during the critical examination period. The reasons for opposing the establishment of a regulated, well-defined program of courses in the main subjects have been presented above. Every teacher quite naturally considers the subject in which he is interested of prime importance; nobody wants to play second fiddle. We cannot hope to change human nature.

The merits of a five-year, as against a four-year course have been much discussed. I am of the opinion that in Austria and in Russia the quinquennium ought to be retained and that it ought to be introduced in Germany in spite of the fact that the Prussian Ministerial decree of July 20, 1861 (Von Bethmann-Hollweg) pronounces against it. In referring to the expansion of the examination to cover the subsidiary subjects, this order says: "By such an arrangement (the expansion of the course to at least five years) the very considerable number of poor students would be so inconvenienced, in consequence of the already comparatively large expense of their studies, that the measure could be justified only on the ground of necessity. It cannot be asserted that in order to prepare a physician thoroughly for his future profession it is imperative for him to pass, with more or less doubtful results, an examination in all the subjects listed above (logic, psychology, mineralogy, zoölogy and botany). Since, with diligent effort and average intelligence, the physician can acquire the indispensable knowledge within a period of four years, and since it is open to all to continue their studies beyond the quadrennium as long as they wish to, or are able to, I have felt myself compelled to dissent from a general lengthening of the time requirement for the medical course."

The Cost of Medical Preparation.—I cannot altogether concede the validity of these arguments. As for favoring the poorer students by maintaining a shorter course of study, I do not think it wise as a matter of principle for the state to express such sentiments. I have already pointed out the unfortunate consequences of such a policy. Certainly it is humane to give financial support to individual students of exceptional talent, if they should need help; and I would stress my opinion that diligence alone would not warrant such assistance. But it seems to me a doubtful procedure to lower the scientific standards of the medical profession in order that as many poor people as possible may become physicians. I consider it my duty to dissuade anyone from the study of medicine who has not at his disposal a certain minimum amount of money, education, industry and talent.

I shall define more precisely the minimum already suggested. A student of medicine requires during five years of study at Vienna 1,000 florins per year; for the examination year, and for travel in the interest of science, 2,000 florins; for two years of practical work at a hospital, 1,000 florins per year; for the first six years of his independent practice, 500 florins per year. Altogether for fourteen years he needs 12,000 florins, or 24,000 marks. This is certainly the minimum and it is based on the assumption that the student will not early in his career commit the folly of marrying a poor girl. Anyone who cannot command these resources, which he must either possess in his own right or receive from others, and who is not prepared to give up a considerable degree of comfort in his manner of living, will find the study and practice of medicine a source of lasting misery. All parents ought to be warned against thrusting their sons into this unhappy life.

It will be objected here that it is brutal to make a scientific career dependent on the possession of money; that great talent and genius can overcome all obstacles. Yes, great talent and genius! In all my experience I have found scarcely one genius among a thousand poor students. Ask the men who have worked their way up under such circumstances whether they advise poor boys to study medicine. I am sure that they will be most emphatic in dissuading them, for they know too well what poor students must endure in the struggle for existence.

Average talents do not develop at all under adverse conditions; they absolutely deteriorate. But they prosper and increase in power if their possessors can carry on their studies without worry over material circumstances. All civilization begins with property, and on it depends the political qualification of the voter. The development of industry, of art, of the sciences is dependent on property, which is in turn increased by development. This is an ancient natural process; how can it be otherwise in the physician's art?

I should like to propose another indirect tax on the students of medicine—namely, that no one be admitted to the medical examination who has not completed his twenty-fourth year. It is possible for a person to learn enough at an earlier age to practise the art of medicine, but for the medical profession in all its phases few men are sufficiently mature before their twenty-fourth year. To me it seems self-contradictory when the state permits a minor, who is not even allowed to control his own property or to vote, to have jurisdiction over the health and the lives of human beings. Completion of the high school course at the age of sixteen, and of the medical examinations at the age of twenty or twenty-one, provides a relatively cheap career, to be sure, but in my opinion this condition ought not be tolerated by the state.

I would not by any means deny—granted an adequate preparation and "diligent effort and an average amount of intelligence," to use the words of the decree mentioned above—that in four years a student may acquire the amount of knowledge required in any of the examinations described above. But that poor students, who in order to live must spend more time in giving lessons than in hearing lectures, and who must constantly interrupt their courses because the lessons on which they depend conflict with essential courses, can accomplish as much, that I question emphatically. For them an extension of the course must at least in some measure replace concentration.

In the days of compulsory curricula and prescribed courses such types as now occur among medical students were much less frequent, except in the first two years, in which attendance at only three lecture hours a day was required.

The Minimum Requirement.—I cannot agree with the view that the state should demand only the "most essential" in a course of instruction that is at least in general under state control; it ought to demand all that is pertinent and serviceable. For this reason I favor the five-year course. In Holland and Belgium men study seven years, in Sweden often for ten years, before they may take the final examination and go into practice. It is a mistake to assert that undue emphasis on the descriptive sciences necessitates the extension of the modern medical course. Let us recall that of the quinquennium which was customary in the sixteenth and seventeenth centuries, two years were spent in the study of the "arts" including the natural sciences, and only two years in the study of medicine proper. It is rather the expansion of the practical medical sciences that chiefly complicates the modern course. We must remember that the combination of surgery and its technic with medicine is scarcely fifty years old. We must keep in mind the enormous development of pathological anatomy, of ophthalmology, and above all the expansion of the technic of examination in internal medicine. All this greatly complicates teaching and study.

It is also in my opinion erroneous to believe that the sum total of memorized knowledge necessary for an examination is greater today than, let us say, in the last century. Read Galen, Avicenna Fabry, Paré, etc., and try to memorize all the hundreds of formulæ, of speculations, of citations from old authors, as students in those days had to do in order to be prepared for the disputations, and you will soon be convinced that this was not a trifle. The brain of a doctor in those days had to grasp and retain just as much as now, perhaps even more. But the manner of studying and the importance attached to the knowledge of any given subject were quite different. What the ancients considered essential and of the greatest practical importance seems to us often worthless, if not actually absurd. Our great-grandchildren will perhaps in many things think the same of us. In any case, a person had always to learn very much in order to become a doctor, especially in the days when a "doctor" was thought of as a man of learning, whereas today he is merely a man who has learned.

Many of my colleagues assert that the course should be entirely elective, and that only the severity of the examinations should serve to protect society from ignorant physicians. This may be justified in other fields; in medicine it has only a qualified validity. A person may have learned a very great deal and still be an exceedingly unskillful physician, who awakens little confidence in his powers. Medical work, especially the beneficent and practical effectiveness of a physician, is made up of so many factors that even the most severe examination furnishes only a very limited basis upon which to forecast the candidate's future medical ability and success.

The detection and correct synthesis of symptoms, the ability to distinguish between what is important and what is not, to decide when and how to act, depend as much on special talent as on experience and knowledge. The manner of dealing with patients, of winning their confidence, the art of listening to them (the patient is always more anxious to talk than to listen), of soothing and consoling them, or of drawing their attention to serious matters,—all this cannot be learned from books. The student can learn these things only from immediate contact with the teacher, whom he will unconsciously imitate. To the talent for such methodical imitation must be closely allied the inner urge to discover the seat of the disturbance in the diseased organism, partly because of our interest in such problems, and partly because it gives us pleasure to benefit other people, to help them and, where help is not possible, to comfort them. The patient longs for the doctor's daily visit; it is the event upon which all his thoughts and emotions turn. The physician can do all he has to do with speed and precision, but he must never appear to be in a hurry, and never absent-minded.

It is this quality that makes the doctor popular and brings him friends and practice. Much of all this can be learned from watching others, but it cannot be tested in an examination, not even at the bedside. I am by no means in favor of omitting all examinations and allowing the public to decide by whom they wish to be treated, but I can only repeat that the amount of knowledge that can be acquired in a four-year or five-year course and that can be tested in the severest examination is in some quarters overrated. The physician must be above all conscientious and deeply in earnest. Where in a given case he finds his knowledge deficient, it is his duty to fill these gaps at once; hence he must know how and where to find the information he needs in order to help his patient. Every clinical lecturer at once goes to the library when confronted with a rare case, before attempting to deal with it exhaustively in his lecture. I see no reason why the physician should not do the same when confronted with things that puzzle him.

Migration.—The restrictions upon the right of students to migrate from one university to another are now very few at the German universities. I shall not go back to the times before 1848, to the absolute liberty extended to foreign students in Austria in the days of Maria Theresa, and the rigorous restrictions in the days of Metternich; nor to like conditions in other German countries, to the outlawing of the Swiss universities, etc. In the German Empire and in Switzerland there is now complete freedom in this respect. Attendance at Austrian universities that have a medical faculty is also permitted, and the semesters spent at these universities are counted as part of the required four-year course.

The Austrians may attend foreign universities, at which freedom of teaching and study prevails, for three years without losing any time in completing the quinquennium, but all medical students must study for at least two years at Austrian universities.

Some professors are in principle opposed to the migration of students to different universities. I am not one of these; on the contrary, I consider one or even several changes highly desirable, entirely aside from later travels. The influence of the teacher on the student is in most cases so individual that its value to the student's education must not be underestimated. It is possible to write more or less objectively, but in the natural sciences and in medicine, where his lecture notes are no longer the teacher's chief reliance, but where everything hinges upon demonstration, upon the presentation of anatomical, physiological and pathological images—here it is no longer possible to teach objectively. The mode of expressing ideas, the manner of their presentation, the method of thought, all these are decidedly subjective in character.

Thus it is that one student finds himself especially drawn to one, and another student to another teacher. He finds pleasure in listening, observing and learning from the chosen teacher alone. The subject matter taught is now pretty much the same everywhere, but the manner of teaching it differs very much. The student, for example, reads a text-book; he gets a mental impression of the author and feels drawn to him. He meets other students at the different universities and hears them speak with enthusiasm of a favorite instructor. This stimulates him and sometimes influences him to go to a particular university.

Many university teachers become popular suddenly; fame comes upon them unnoticed, in ways that are hard to trace, because the reasons are as a rule highly individual. There are professors who affect their students as the piper of Hamelin affected children.

Now if the student makes his choice with enthusiasm, he will study with enthusiasm also, which is as it should be. It furthers study more than most people think—more than all study programs and all curricula. In my own experience I have found men who were wasting their time in a stupid and blasé manner at one university, and who, migrating to another, were suddenly seized by such an admiration for some teacher that they became the most industrious of students. The power of sympathy and antipathy among persons of every age and of both sexes, often incomprehensible to an observer, cannot be argued out of existence by any reference to the necessity for objective teaching.

There are external reasons, too, that favor migration among the universities. Students frequently get into situations at one university town which are in themselves innocent enough, but which may become very annoying and may interfere with their work. Student societies, or family connections, or cliques, gradually absorb their interest and their work suffers in consequence. Not all young men have the strength to free themselves from such fetters while they remain in the old environment. In such a case, a change of scene frequently gives renewed life, and saves the student from slackness and enervation. The change of scene in itself, with the attendant change of conditions, association with differently constituted, differently thinking German stocks and races, serves to strengthen the student's powers, broadens the range of his experiences and thoughts, polishes the rough edges and corners, and teaches him early in life to be tolerant of the weaknesses and appreciative of the worth of others. The gain in character and independence from such a change is to be valued at least as highly as the scientific advantage. It is not at all necessary that the instruction be much better than it is at home; our domestic virtues can be better appreciated if we know the rest of the world, not only from hearsay, but from personal observation. How ill-fitted the great cities are to provide all that is desirable in a medical education, I have already stated.

State or Faculty Examination?—Whether a state examination or a faculty examination is the better has been violently argued, especially at Vienna. In this form the question has almost no meaning, for ever since the universities became state schools the professors have really been state officials. They are responsible directly to the sovereign and the Minister, who is the highest representative of the law. There can be no question then, that an examination given by officials of the state and ordered by the state for specific state and social purposes, is a state examination. Although no faculty examination can therefore in a sense be anything but a state examination, we usually understand by the former term an examination which is controlled only by the faculty as a corporation without any specific control of the examination procedure by the state. Such a faculty examination, conferring the right to practise, existed from 1849 to 1872 in Austria and still exists at Dorpat. The present Austrian examination is, as already pointed out, not purely a faculty examination, because it is always "supervised" by a government commissioner.

But those who discuss the question usually do not have all this in mind. They mean that the right to practise, the *venia practicandi,* which is in a sense the "guild license," should be conferred exclusively by the highest medical and health authorities, which in some countries are a part of the Ministry of Education, in others of the Ministry of the Interior. This point is certainly open to attack; in practice it is handled in various ways. The most widespread usage is to regard all students as subject to the Department of Education, and all examinations required in the schools as in the hands of the Ministry of Education. If we wished to depart from this principle, the examinations in law would have to be put under the control of the Department of Justice, the examinations in the technical schools and the schools of commerce under the control of the Department of Commerce, and of the theological faculty under the control of the ecclesiastical authorities. This is done in some places, but not everywhere. In such cases a distinction is usually made between the university examination—which, like the examination at the end of the *Gymnasium* course, is taken as a requirement for the completion of the university course, and although more or less a professional examination, confers no further civic rights—and the examination required by the authority which controls the special privileges of the profession in question. This distinction between the faculty and the professional authorities in a Ministry is of recent origin. Not only in the Middle Ages was the practice of medicine under the control of the faculties; even Gerhard van Swieten was, under Maria Theresa, virtually an omnipotent Minister of Health. He united in his office and his person control of the entire machinery of sanitation and medicine, and the administration of the medical faculties. No one stood between him and his sovereign. Under such circumstances there would have been no point in separating the faculty examination from the professional examination.

In Prussia the conditions even at the beginning of the last century were different. I have pointed out (p. 117) how the state found itself embarrassed in its attempt to have practising physicians give a second examination, after the candidates had passed the faculty examination, because it could not find enough suitable examiners. The fact that in the entire German Empire, in Switzerland, in Austria, and in Russia, the examination for the right to practise can be taken only at the universities, proves beyond a doubt that the examination can best be conducted (and in the most convenient and inexpensive manner for the state) by the university teachers. That these medical teaching corps in the German Empire and in Switzerland are not *eo ipso* accepted as permanent examining boards, is probably due to the fact that the medical authorities did not wish to, and could not, issue orders to the teaching bodies as such, since the teachers were not under their jurisdiction, and were not everywhere numerous enough to fill all the places on the examining boards. The state therefore preferred not to constitute the university teachers, as such, the examining boards, but simply to consider them individually as the persons best fitted to be examiners, and in this way to eliminate direct control of the Ministry of Education.

The medical authorities, however, hesitated to assert the right to grant the doctor's degree when granting the right to practise, and therefore made the right to practise independent of the degree. Two categories of physicians, those with and those without the degree, were thus created. The right to use the title of "doctor" (in Prussia the unauthorized use of the title is punishable) traditionally gives those physicians who have earned it a better standing with the public, which is only just, since the title is obtained by showing greater scientific attainment than the minimum requirement, and is gained only on passing a separate examination given by the faculty. It was probably the intention in the German Empire, in Switzerland, and in Russia, to reserve the opportunity for physicians who might wish to distinguish themselves by this greater attainment. The value of it is denied by the opponents of the system, though quite unjustly. Its significance depends, to be sure, on the strictness of the different faculties toward the candidates; there is even opportunity for the faculties at the various German universities to compete with each other in making the examinations for the degree difficult. If this were done, the value of many a diploma would be greatly increased, and a Doctor of Medicine at the University of Berlin might, for example, enjoy a greater measure of public esteem than a Doctor of

Medicine of the University of Würzburg. In England a complete, traditional system of degrees has been developed, without any intervention on the part of the state. An English physician may describe himself on his sign or his card as a "fellow" or "member" of the College of Physicians, or of the College of Surgeons, or as a Bachelor of Medicine, or Doctor of Medicine.

It has been urged against the retention of different grades among physicians that the earning of a doctor's degree is after all chiefly a question of time and money. A person who has means enough to study for a longer time and to pay for the examination, the dissertation and the diploma, will take the doctor's degree; one who is not in a position to do so will have to omit the formality. It is not, however, so completely a matter of money. Aside from the venture of a more or less difficult examination, it implies the urge or, if you please, the ambition, to be distinguished from the crowd, and this really ought not to be deprecated. In the last analysis all higher learning and all attainment above the average require time and money, but this is no reason why the state should prevent certain individuals in the various professions from using their means to advance beyond other individuals. If we wished to carry this theory to its logical conclusion, we should have to admit that for a man to continue studying until he knows enough to be a professor is also chiefly a question of money.

Because the Austrian government has recognized the medical faculty as the permanent examining board for the granting of the right to practise, and has required it to grant at the same time the doctor's degree on the basis of a comparatively easy state examination, the medical faculties of the Austrian universities are most unpleasantly distinguished by the fact that they have been deprived of the right to grant the doctor's degree on their own authority, uncontrolled by the state. It seems almost as if the authors of this examination program had suffered a violent attack of social democracy, since they wish to recognize no differences of degree whatsoever among physicians; all are to be equal.

In the discussions on the subject in faculty conferences I expressed my opposition to the now almost universally abandoned Prussian theory of Von Altenstein, not to choose the examiners from among the university teachers, and fought for Van Swieten's principle that the professors must also be the examiners, which has been recognized as practicable. Perhaps in order to avoid the formality of reappointing the same examiners annually, and perhaps also in order to carry on the old tradition, the faculty was created a permanent Examining Board, delegated by the state and to be supervised by it. Besides coquetting with the democratic theory of the equality of all physicians, the government was probably also influenced by the desire not to make the examinations more expensive by requiring a separate examination for the doctorate. It was apparent that a majority of the faculty favored this attitude, but I urged that in place of a separate examination for the doctorate, at least an extensive and comprehensive final examination covering all the subjects represented in the faculty be introduced, so that the faculty might convince itself once more of the all-round scientific training of the candidates. This, however, was not adopted. Some saw in the proposal only a means of influencing the students to repeat certain courses, as, for example, anatomy and physiology, and declared that they were as a matter of principle opposed to demanding of the candidates a second examination in the same subjects. Consequently the Austrian medical students, on passing the examination for the right to practise, receive the title of doctor as a free gift from the faculty. I suppose we shall presently see the graduation exercises themselves placed under the supervision of a government commissioner!

Aside from the fact that it presupposes a five-year course, the present Austrian medical examination is the easiest examination of its kind. This is especially true of the Vienna examination, where the number of candidates is so great that the professors, because of the endless examining of individual candidates, cannot always exercise the desirable degree of care. More examining boards are imperatively needed. The more examiners there are, the less will the attendance at the courses of the different professors be affected, for it will then become impossible for the candidates to take courses with all the examiners, assuming of course that the co-examiners are also invariably professors, although this is not required by law. Whether the examination remains under the supervision of the Ministry of Education, or whether it is put under the jurisdiction of the medical authorities of the states that have universities, in any case only the right to practise, and the title of "Physician, Surgeon and Obstetrician" should be conferred. The right to grant the doctor's degree, to be given after the most difficult scientific examination possible, ought to be returned to the faculty as such, freed from all state control. The degree would then be granted only to those who have the qualifications and the means to study, and would be more highly honored.

I have no doubt that there were serious reasons for not making the examination too difficult; it may have been open to question whether the lay surgeons who formerly controlled rural practice would be replaced by the holders of the doctor's degree. It is certainly humane to provide the rural population with well-trained physicians, and I should certainly not recommend that the standards of the examination for the right to practise be again reduced. In the absence of any special regulations on the part of the communities and the state, an approximately even distribution of physicians in the rural districts, such as existed in the past, will not again be achieved, since physicians have the right to settle anywhere in the Empire. If the former lay surgeons had enjoyed this freedom they would not have been so well distributed throughout the country as they were. The reason for the alleged shortage of physicians is not to be sought in the very slightly increased standards (a statistical investigation into these rumors is in order), but rather in the new right to settle anywhere, as well as in the steady reduction in the number of medical students, not only at the German universities of Austria (although more particularly at these) but at all the universities of the German nation.

Far more menacing than any possible reduction in the number of physicians is the growth of competition among physicians in the large cities, while the number of physicians in the rural districts in many places is decreasing so rapidly that frequently there are no physicians for miles around. I have already touched on this point. Some wish to demonstrate by this argument the necessity of restoring the old lay surgeons. I am quite sure that it is not his better scientific training that prompts the physician of today to seek his practice in the city, but rather his inclination to risk competition in the city in preference to a meager living without competition in the country. He knows that because of the poverty of the rural population there will never be any chance of materially increasing his earnings. Most physicians prefer to use up the remnant of their resources in the first few years of practice, or even to go into debt, or to starve, with a chance of securing a better position in the course of time, than to be near starvation in a rural district all their lives. The lay surgeons of former days would not have acted otherwise if they had had their choice. But they did not have the right to settle where they pleased; they were bound to a province, to some crown land, to some district, and wherever they ran foul of some doctor of medicine, they had to limit themselves to bleeding and cupping and were subject to all sorts of chicanery.

All that is over. The physician, as a technical craftsman, withdraws when he cannot earn a living. That is one of the consequences of industrial freedom everywhere. It is the duty of the state to correct the resulting harm, or where there is local self-government it is the duty of the communities and the great landholders. In some places the physician ought to be provided with a house, as is already done for the clergyman—a community house if need be—and he ought to be guaranteed a certain amount for his services. Where the communities are too poor to do this, the state must do it. All this is the result of professional freedom, and not of the better education of physicians.

According to Paragraph 6 of the Industrial Code of the German Empire dated 1869, the right to absolute industrial freedom is not made to apply to the practice of the art of healing. Paragraph 20 provides that "Apothecaries and those persons who describe themselves as physicians or by some similar title must have a certificate. The certificate may not, however, be made dependent on the prior acquisition of the academic degree of doctor." Paragraph 147 provides that "anyone who, without being licensed to do so, describes himself as a physician, or who uses any title that may lead people to believe that the user is a licensed medical practitioner (and this includes the title of doctor of medicine) will be liable to a fine of 100 talers or less, or in cases of inability to pay the fine, to imprisonment for six weeks or less." This gave the doctors some degree of protection against the quacks, although the old laws against them have been repealed, and there are no longer any direct methods of dealing with quacks. But the laws governing the sale of poisons, the laws relating to pretensions that cannot be made good, to the extortion of money, and to fraud, are often applicable where the facts are known and a complaint is lodged.

The greatest protection afforded the quacks and miracle men lies in the fact that complaints against them must usually originate with the patients who believe that they have been cheated. Any patient may seek help wherever he pleases. Even if he believes in direct revelation and in miracles, he is usually so well-bred that he shows as little surprise if the miracle fails as when his prayer for health or for five gulden is not answered; but he is ashamed to admit to others that his hopes have been disappointed. The sense of the law is probably that the public must learn to guard against charlatanism by an increasing educational standard. That goal will probably never be quite reached; a patient is almost irresponsible in matters relating to his disease, especially if it is incurable. Indeed, it is difficult to convince a person directly or indirectly that his condition is incurable. Even the most thoroughly educated individual, though he can be convinced of the incurability of the disease of another person, steadfastly refuses to believe that his own case is hopeless. Nearly every normal individual proceeds from the theory that all diseases are curable, that they always have tangible causes; and he finds more relief and consolation in the thought that his disease was caused by his own negligence, or by that of someone else, than in the thought that he was predestined to his ailment by heredity, or that the causes of it are unknown. Almost everyone unconsciously counts himself an exception.

Paragraph 1144 of the Industrial Code quoted above has at last freed physicians from the legal burden of being forced to render assistance under all circumstances: "But the regulations for medical persons which impose upon them the obligation to render medical assistance under pain of penalties are repealed."

For many older physicians the thought that they are classed among those engaged in a trade is still a revolting notion. I find, however, that this can only improve the material position of the physician, nor will a humane, kindly doctor on that account lose one iota of the respect, the love and reverence which he has earned by his work in the community. It is to his credit if through his talent and his prolonged studies he has won the right to render medical assistance to his fellow men. A man of quality knows without compulsion of law that duties are inseparable from rights and privileges, and in those he will not fail under ordinary circumstances.

PART IV

THE TEACHING STAFF

How Large Shall the Faculty Be?—How many professors are needed, and what other equipment is necessary in order to train physicians in the natural and medical sciences in accordance with present-day demands? Perhaps some will exclaim right here: "There cannot be enough teachers, enough laboratories, enough universities;" but that is a mistake. The financial capacity of every state has its limits. In this instance we are concerned with very expensive laboratories, the maintenance of which on the high scientific level of our day has become increasingly costly. These laboratories cannot be made independent of general financial and business conditions, of good and bad harvests. They require the same sums for their support under all conditions. It became the generous rulers of former days very well when, in order to lend to their crowns the reflected glory of scientific achievement and to promote knowledge in their territories, they provided for the founding of a university by grants of land and allotted to it a fixed income out of their own personal fortunes. Today, however, when the plain citizen himself, and almost without assistance, is expected to furnish the money for the universities (we must except here a few universities with rich, ancient endowments) he has the right to ask whether the sacrifice he must make is commensurate with the results which he hopes to accomplish.

From the most practical point of view the state will regard the university first of all as a training school for its lawyers, its officers, its teachers, physicians and clergymen. It maintains its own universities in order to make itself independent of other states; and it will calculate what each lawyer, each doctor, etc., costs. Most of the small states that maintain universities will discover after such a calculation, that they produce (the word used in Vienna is "create") their officials, teachers and physicians at an enormous cost, even when they take into consideration that the money which the foreign students bring into the country goes into general circulation, and benefits not only the inhabitants of the university towns, but the state itself, inasmuch as part of it flows into the treasury in the form of income taxes. If they were then to compare with these results the sums of money that would be taken out of the state if their young men studied in other countries and returned with their education completed—sums which, to be sure, are not spent in the country, and so escape the home consumption taxes, but which are still subject to income tax, since the students are usually minors and the taxes are paid only by their parents—they would soon be convinced that the latter procedure is far cheaper. The situation is different for large states. The funds to be raised can be divided among a far greater number of taxpayers, and they have it in their power to establish as many universities as their means and requirements dictate, and to decide where they shall be located.

It does not come within my purview to make this calculation for each individual German state. I should have to find first how much each of the medical faculties costs annually, and then how many physicians each of them turns out per year. Then I should have to find the mean production cost, and on the basis of this each state would have to determine for itself whether the means at its disposal for the maintenance of its medical profession sufficed for the support of one or more medical faculties.

No one can say whether we shall ever arrive at a practical application of some such economic measure. Let us be glad for the time being that until now the voices of those who look upon the faculties from this point of view, as factories for the production of officials, physicians, teachers and parsons, have been drowned out in our parliaments, when they have become vociferous, by the indignant protests of the majority. But it is well for those professors who would enlarge the demands of their institutions indefinitely, to remember that such a policy must lead to the destruction of many universities which in spite of their small size have nevertheless been, no less than the great universities, centers of knowledge and have exerted a large influence, both extensively and intensively. The German nation may be proud of the fact that it has so many universities.

Never yet, not even in our times, which are so unjustly charged with a grossly material outlook, has the founding of universities proceeded from the motives suggested above. On the contrary, if in former days it was the good intention of some nobleman, or the desire to support the church, or at times even vanity, that influenced such foundations, in recent times it has been our national and political interests that we have desired to serve by founding new seats of knowledge.

It is only in very small measure due to our practical needs that the existing universities are being maintained. It is rather the pride of even the smallest state, that will not permit a child to perish which has brought it and the German nation so much pleasure and fame, but is determined to maintain it in health and vigor. Whether there is any truth in the assertion that the German Empire and Switzerland have more universities than they need, we shall discuss later; but the nation, like a mother, does not wish to lose any of its children, even though it may now and then be hard to raise the necessary means for their support. It is one of the finest and noblest phenomena in the history of German civilization that a city like Basel should keep its ancient university at such a level of efficiency that it can compete successfully with its neighbors. How great are the sacrifices that Baden must make to keep its two universities up to the mark! What relatively large sums must Mecklenburg spend on its Rostock, Hesse on its Darmstadt, and Weimar on its Jena!

What German would not deeply lament the passing of these universities, with which so many incidents in the history of German civilization are bound up? The benefit of a university, especially in a small town, is illimitable; the town becomes the home of the Muses, it becomes hallowed for all time. It illuminates the whole country like a sun, shining now with a subdued, now with a more brilliant glow, but always shedding light and warmth. At times the luminous body, in itself not of the first magnitude, becomes so radiant that the whole world looks up to it, and even the greater suns are forgotten beside it. Then again the light may fade, and its dying glory may fall like a meteor into another sun. But soon it shines again in other colors, red for a time, then blue, then violet. And so it goes; suns and stars are peculiar things. What are they to us? What do they give us? They give us light and warmth, so how could we possibly live without them?

Let us subject this light to a spectral analysis, and let us figure out these thermal units.

We shall discuss the connection of the medical faculty with the whole university later. Here I shall merely mention that I consider the professors of physics, chemistry, mineralogy, botany and zoölogy as an intimate and inseparable part of the medical faculty.

How shall a medical faculty in the narrower sense be constituted? I am of the opinion that a staff of nine professors is necessary in the present state of the science. These are: 1. anatomy; 2. physiology; 3. general pathology and pathological anatomy; 4. pharmacology, pharmacognosy and prescribing; 5. special pathology and therapy, medical clinic; 6. surgery and clinic; 7. ophthalmology and clinic; 8. obstetrics and clinic; 9. social medicine (medical jurisprudence, state pharmacy, hygiene). Each of these subjects should be represented by a full professor. To each professorship must be attached the necessary laboratories, collections and assistants. The laboratories, especially the clinics, should be under the direct supervision of the university, as purely academic hospitals.

The Council.—Pleasant as it may be if the number of permanent teachers can be greater, I would nevertheless insist that the number of full professorships be not increased, for I consider the number of the Muses as sufficient to meet all needs. Of course, the right men must be assembled; without these nothing can be done. If the number is much smaller, it will result, even if complete harmony prevails among them, in a far too familiar treatment of the business in hand; while in case of disagreement it will lead to far too brusque a clash of stubbornly opposing interests. A much greater number, on the other hand, easily destroys unity of action and co-operation, weakens the influence of the individual on the group, and deadens interest in the welfare of the faculty as a whole.

As to the way in which the modern system of practical medical instruction is to be supplemented by the use of assistants—whom the faculty must be authorized to employ in such numbers as will provide not only the requisite help for the instruction of the students, but ample opportunity for the higher training of these young teachers themselves—of this matter I have already spoken at sufficient length.

If any distinctions are to be conferred on the assistants, aides and lecturers, they should be given the title of Honorary Professor. With this title may ultimately go the rank, character and duties of a Privy Councillor, or of a full professor. They may even for special reasons be given the highest rank and salaries; or they may be called adjunct professors—a title which I think should be entirely abolished. *But they should be left out of the council.*

The subjects listed in the proposed faculty are the ones which in my opinion should now be designated as "departmental subjects," as requiring one man's entire time as teacher and investigator. If his duties should prove too heavy he should be given an assistant, whose appointment, after a short probationary period, should be for a term of about five years, with the option of a second election, but without any prescriptive claim to succession to the professorship in question. If he makes good he will either be called to a full professorship at another faculty, or in case of a vacancy he may succeed his superior. But one should not be too considerate if the young man has shown himself to be not particularly useful, or if he is not fitted to represent the entire subject. Everyone who enters upon an academic career must understand at the beginning that he may have to stop at a half-way station.

Since our general observations and recommendations must have regard to the interests of the smaller universities, I am of the opinion that for the latter the extension of the faculty proper beyond the nine subject-departments stated would be highly inadvisable, aside altogether from the before-mentioned disadvantages of having too large a faculty.

New professorships would disturb the departmental balance in the faculty. A newcomer, representing none of the departmental subjects, will clash more or less with other departments, and infringe upon them here and there; in short, he will cause friction that can be avoided.

If the adjunct professors who have received this title in reward for special attainment are taken into the faculty, as in Austria, Switzerland, and Dorpat, there can be no real unity in the council. The council members, with their unequal teaching burdens, will not feel in harmony with each other. It must be irksome to the departmental professor to feel that the votes of colleagues who perhaps teach some small specialty have the same weight as his own. It is not inequality in rank, but inequality of duties that hinders co-operation in the faculties. It gives rise to unpleasantnesses, ill-feeling and indolence. It destroys interest in the welfare and prosperity of the faculty in the very men of whom the state expects such interest. It drives the individual to take refuge in egoism when he sees the realization of ideas, of whose value he is altogether convinced, wrecked by a clique of associates whose combined teaching responsibilities are scarcely equal to his own.

Whenever a vacancy is to be filled, the adjunct professor who hopes to succeed to the post will combine with his friends to form a party, promising them his help on another similar occasion.

We must always proceed from the assumption that the state has constituted the personnel of a faculty according to the scientific needs of the times. Each member should represent a department, and therefore all members of the council are equal. Even if certain ones may be personally favored in the matter of salary, rank, or in any other way, their relative position as professors is not thereby changed. The state determines what *departments* are to be included in the faculty. When a position is vacant, it is filled and the newcomer becomes the departmental professor, and a member of the faculty council. What right, then, have the adjunct professors to be included?

If the state cannot afford to pay equal salaries to all the newly-appointed departmental professors, it ought to give the smaller salaries to the younger men. It is not necessary that every young professor should begin with the maximum salary. The first requirement for an academic career is the capacity for doing without many things.

Adjunct Professors and Lecturers.—All this has been said so often, and yet the adjunct professors and even the lecturers continually raise the same cry, that "they are just as good teachers as the full professors. All teachers ought to have equal rights. Some of them do more than many a full professor," and other similar protests.

Reward them for their services; give them the dignity of Privy Councillors or Court Councillors; give them decorations big and little—*but do not admit them to the council.* I have been a lecturer myself, but it never occurred to me to doubt the propriety of the existing arrangements. I did at times, in the resignation of despair, feel that my powers were not equal to an academic career; or if, in an exalted mood, I thought I had accomplished something worth while, I felt that I was as great as this man or that. But it could never have entered my mind to claim that as a lecturer I had the right to a voice in the faculty council. That always seems to me quite senseless.

A word should be said about the large faculties. I do not here refer to Vienna, but to faculties with a regular attendance of 200, 300 or 500 students.

Let me begin with the assumption that clinical instruction can be adequate only when the teacher has at least fifty beds at his disposal, and when the number of students in regular attendance at the clinic does not go much beyond the same number. Since I assume further that each student attends the medical and surgical clinic for two years, and the obstetrical clinic and ophthalmological clinic (each with twenty-five beds) for a year, then each class (assuming that the classes are approximately equal in size) should not contain more than twenty-five students. In a university having the four-year course the normal attendance in the medical faculty will be 100, and where the five-year course prevails, it will be 125.

Now what shall be done when the number of students grows beyond this norm? The anatomist, the physiologist, the pathological anatomist, the obstetrician, as well as the professors of pharmacology and social medicine, can handle groups of fifty, and even groups of one hundred regular students by increasing the number of their assistants. But when the attendance at a medical or surgical clinic goes beyond sixty, or at most eighty, or at the ophthalmological clinic beyond thirty or at most fifty, this expedient does not solve the problem. The students have not come to the university merely to watch the assistants examine or operate on the patients. They have come primarily to be able to observe closely how the professor does these things.

If we must then begin to duplicate clinics and clinical positions, the question arises: what shall be the relation of these twin professorships to the faculty? In my opinion only the senior professor ought to be in the council. The junior, even if he receives the higher salary, and has the higher rank, ought to be outside the council. If this does not seem feasible, two faculty councils ought to be established, one with broader and the other with narrower jurisdiction.

A faculty organized on a large scale must also make provision for the subjects not included in the nine basic professorships. Large faculties frequently include a psychiatric clinic, a clinic for skin diseases and syphilis, and a clinic for diseases of the ear. Where the material is adequate there may also be propædeutic clinics; but these will serve their purpose only if they remain in intimate touch with the main clinics or are conducted as out-patient departments. In this larger scale there is room, too, for special professors of physiological chemistry, of hygiene, and of the various branches of the natural sciences.

A university building in one of the larger cities ought to be dignified and elegant, and richly ornamented, if it is not to make a mean impression when compared with neighboring palaces.

This applies especially to the University of Vienna, the most beautiful and valuable jewel of the Austrian crown. It ought to shine from as many facets as possible and be given a rich setting of imperial munificence.

With an average attendance of 1,300 medical students Vienna ought to have, according to the principles set forth above, ten teachers' councils in the medical faculty. If we take into account the inequality in registration in the different classes, the irregularity in attendance (factors which, in a school with so many students, may vary by a hundred or more in a semester without giving us the right to call the students at Vienna lazier than others), the university would be able to get along with six medical and six surgical clinics and clinical professors, four obstetrical and eight eye clinics and the necessary complement of professors. It would need four anatomical laboratories and anatomists, four physiological laboratories and four psychologists; four laboratories for pathological anatomy and four pathological anatomists, two professors of pharmacology, two professors for social medicine, and two assistants for each professorship—a total complement of eighty assistants. In addition to this, there would be the special clinics.

Assuming that out of its inexhaustible means the Austrian government were to provide all that would be necessary to organize this monster faculty and to maintain it at Vienna, would the desired goal be reached? It is possible to predict with certainty that it would not. An equal distribution of students could be accomplished only if these were, as formerly, divided into classes and compelled to attend the clinics as prescribed for them. The entire student body would rise as one man against such a measure.

An increase of clinics at Vienna would never prevent the students from attending the courses of those teachers who are most congenial to them, or—to use a trivial but not altogether inaccurate expression—those who at the moment are the fashion. This would be all the more certain, since, where there are so many teachers, all consideration of the examination, which is still taken into account when only two examiners alternate in each subject, would quite disappear, inasmuch as the chance of being examined by any particular professor would be altogether negligible. I assume that all the professors, divided as heretofore into examination boards in the faculty or state examination, would take turns in examining.

What the faculty council would be like if all the teachers I have mentioned, and in addition, half this number of adjunct professors and presumably eight or ten lecturers were included, I prefer not to discuss.

Centralization.—I doubt whether it is good policy to aim at a centralization of the study of natural science and medicine, like that prevailing at Paris, in which case the departments and laboratories would have to be correspondingly expanded. In that event the provinces would surely be justified in complaining that the money needed for such an arrangement would all be expended at Vienna, and that only Vienna would get the benefit of the cultural stimulus emanating from the presence of the professors and the student body. It seems clear, therefore, that a satisfactory solution of the problem at Vienna can be attained only by distributing the natural science and medical faculties among the imperial provinces. The question now arises:

How Many Universities?—How many universities would the Austrian lands represented in the Reichsrat need in order to provide a satisfactory scientific and practical education with the best possible results, in so far as those results are dependent upon government provisions?

It is possible to arrive at a conclusion with the figures now at our disposal. We have assumed a class of twenty-five students as the ideal number. In a five-year course there would then be 125 students in a medical faculty. This ideal is approximated only in Switzerland, where the Swiss medical faculties have had in the last eight years a minimum aggregate of 336, and a maximum aggregate of 536 students. The mean was 386, distributed among three faculties, giving an attendance at each of 128.

In the German Empire there were in the last eight years a minimum aggregate of 2,743, a maximum of 3,732; the mean was 3,237. This number distributed among 20 faculties gives an average of 161 to each. The German Empire has, therefore, not too many medical faculties, although some of them may be located too closely together.

We shall use as a standard not the Swiss ideal, but merely the conditions existing in the German Empire. Austria (I am speaking only of Cisleithania) has had during the last eight years a minimum of 1,510, and a maximum of 2,398 medical students; the mean was 1,954. On the basis mentioned above, using 12 as the divisor, we get a quotient of 162. Austria should, therefore, have twelve medical faculties in order to be able to provide for the education of its medical men as well as Germany does.

But I shall make some concessions. The equipment at Vienna, especially the General Hospital, is of such vast dimensions; the teaching body is so great, and the inclination, especially among the German Hungarians, to study at Vienna so pronounced, that it would be impossible to stop the influx. Nor will the government be inclined to reduce the attendance at Vienna to any considerable extent, since, he has been pointed out above, a large attendance enhances the prestige of the faculty. I shall therefore count Vienna as four universities, and Prague for similar reasons as two. There would then have to be six more. There are two; four are lacking. The division of students would be about as follows:

Vienna	640
Prague	320
Gratz	160
Innsbruck	160
Salzburg	160
Linz, or Klagenfurt or Triest	160
Olmütz or Brünn	160
Czernowitz	160

Let us hope that the Austrian government may work toward this goal. It has been said that Innsbruck has so few medical students that it is not worth while to maintain a medical faculty there. This is entirely incorrect. Since its restoration in 1869 Innsbruck has had a minimum of 38 and a maximum of 85 medical students; a mean, therefore, of 61. I think this is a brilliant beginning for so young a university, which is largely manned by native Tyrolese. The future rise or fall of attendance will depend solely upon the scientific activity of the members of the faculty. All other conditions favor the faculty, and can be made even more favorable by the construction of new laboratories.

The creation of the faculties and their future prosperity is chiefly a matter of money, as I shall show later. As for the personnel with which to fill the new teaching posts, Vienna could satisfactorily fill three-quarters of the places with her lecturers and adjunct professors, if it were possible to lure these gentlemen, some of whom are very comfortable, away from their intellectual Capua, to which even some of the younger men are bound by private practices yielding four times as large an income as the highest professorial salaries, and more. Only about one-fourth of the men needed for the new chairs of anatomy and physiology could be found in Austria; the rest would have to be called from other German countries. Once all of these eight (or twelve) faculties are launched and have been at work for a few years, there will be no lack of men to take the places of the first teachers.

The unexpectedly brilliant success of the new medical faculty at Strassburg might serve our Ministers as an object lesson on how the thing is done.

Nationality and Interchange of Professors.—I consider it of the greatest importance in organizing a faculty that it should be representative of various German racial groups. Forming a faculty exclusively of natives and making professorships hereditary in certain families, in short, invariable or even extensive inbreeding, always has baneful results. Not only does such a faculty grow lax because of the too great intimacy among its members, but no new and healthy generation can grow out of it.

In no German state, not even the greatest, has it been possible until now to find a qualified inlander ready to fill an accidental vacancy at a moment's notice; nor has it been possible to recall a competent man who has emigrated. Just as in the days of Italy's glory in the Middle Ages the small states scrambled for the artists and scholars of their neighbors in order to give new brilliance to their courts, so the German states have, until very recently, competed for their scholars, greatly to the advantage of science. For it has not only given the professors the opportunity of improving their material position, but has safeguarded them from the slackness that comes from remaining always in the same environment. For in each new place the newcomer had to establish his reputation;

he had to summon all his energies in order to conquer the new territory.

Strange to say, teachers who are barely equal to their tasks at one university occasionally develop quite unsuspected strength at another, and vice versa. Teachers who in one position earn a widespread reputation lose their prestige with another public, in another country. This occurs often, particularly when a man is called from a small university to a large one. In any case, every new arrival brings new life and activity into a faculty; indeed, two or three new men may regenerate a whole staff.

It has been very interesting to determine the extent of this racial mixture in the different German medical faculties, and at the same time to discover which German racial groups furnish most of the professors for our faculties. Through the kindness of my friends and acquaintances at all German universities I was able to ascertain (1874) the nationality of each full professor in the medical faculties, as well as the nationality of the full professors of physics, chemistry, mineralogy, botany and zoölogy.

With the exception of these professors of the natural sciences, I have adhered to the plan of nine departmental professors in each faculty and have disregarded all other full as well as adjunct professorships. In the rare cases where one of the professorships mentioned happened to be filled temporarily by the adjunct professor or a lecturer, I have included the incumbent as departmental representative. Where there were several full professors in the same field, they are all included. Where a professor teaches two of the subjects covered, a very rare occurrence, he has been counted twice, since he represents two individuals. Where departmental professorships were vacant at the time of the census, or where I was unable to discover the nationality of the incumbent, I have not attempted to fill the gaps.

My data were not exact enough to permit of a classification according to racial stocks as such. I was therefore compelled to base it on the political divisions of the German nation as they existed in 1866; in part because they furnish greater variety, and also because the appointment of a Prussian to Göttingen, for example, and vice versa, was in those days looked upon decidedly as the appointment of a foreigner.

On the whole, however, the sources of error are very slight.

Of the 418 professorships which I was able to take into account in my data, 234 are filled by North Germans, and 181 by South Germans. Here, too, I think a correction is necessary: Hesse-Darmstadt should be counted as South German, in which case the proportion would be 220 for the North and 195 for the South. The North, even after this correction, still has a majority of 25.

Among the individual states Prussia has provided the largest number (114). Hamburg, Oldenburg, Anhalt, Nassau, have each provided only one or two professors. The Prussians predominate, especially in physics, mineralogy, zoölogy and physiology (11 in each field), the Austrians in obstetrics (10, most of them from Prague). The number of clinical instructors coming from Prussia (9) is worth noting. I shall leave other comparisons to the reader, after pointing out the uncommonly small number of men from Württemberg (6, most of them, to be sure, men of prominence) as compared with 38 Bavarians, 22 from Baden and 32 Swiss. Among the small states, Hesse-Cassel with 13, Schleswig-Holstein, with 17, and Hesse-Darmstadt with 14 professors, stand out. The city of Frankfort has a fine record with its 9 professors, in comparison with Hamburg (2) and Lübeck and Bremen (0). Of these men, 8 teach natural science and one teaches anatomy. States of moderate size, like Saxony, can furnish in this field only 5, Schleswig-Holstein only 6, Hanover only 8 and Baden only 10. In Frankfort there has always been much appreciation of art and science. The Senkenberg Laboratory has probably been largely responsible for the fact that so many citizens of Frankfort excel in the natural sciences.

Let us now see how many foreigners each country employs in its universities. In this survey I have considered each German state existing in 1866 as foreign to every other. I have considered Cisleithania (Austria) as one state, but Hungary as a foreign state. If each state were able to recall its emigrated professors and dismiss its foreigners, we should see whether the "emigration" would cover the "immigration," how many professors have been produced in excess of requirements, or how many would be needed after the exchange had taken place. In the following tables all this is taken into account:

	Total Positions	*Filled by Natives*	*Filled by Foreigners*	*Excess + or Deficit —*
Prussia (114)	88	60	28	+26
Berlin	17	11	6	

	Total Positions	*Filled by Natives*	*Filled by Foreigners*	*Excess + or Deficit —*
Bonn	14	9	5	
Breslau	15	10	4	
Greifswald	14	10	4	
Halle	14	7	7	
Königsberg	14	13	1	
Russia (14)				
Dorpat	14	12	2	0
Schleswig-Holstein (17)				
Kiel	15	6	9	+ 2
Mecklenburg (7)				
Rostock	12	1	11	— 5
Hanover (17)				
Göttingen	18	6	12	— 1
Hesse-Cassel (18)				
Marburg	14	0	14	+ 4
Hesse-Darmstadt (14)				
Giessen	14	7	7	0
Saxony (19)				
Leipzig	15	4	11	+ 4
Weimar (4)				
Jena	8	1	7	— 4
Austria (68)	74	63	11	— 6
Vienna	27	24	3	
Prague	19	13	6	
Gratz	14	12	2	
Innsbruck	14	14	0	
Bavaria (38)	44	21	23	— 6
Munich	16	11	5	
Erlangen	14	6	8	
Würzburg	14	4	10	
Württemberg (6)				
Tübingen	14	2	12	— 8
Baden (22)	30	10	20	— 12
Heidelberg	16	2	14	
Freiburg	14	8	6	
Alsace (4)				
Strassburg	16	4	12	— 12
Switzerland (32)	42	29	13	— 10
Basel	14	12	2	
Bern	14	10	4	
Zurich	14	7	7	

Altogether the German Empire has an excess of only thirteen professors.

Below is a table showing the number of those who have emigrated:

From	Prussia	54	Professors
“	Russia	2	“
“	Schleswig-Holstein	11	“
“	Mecklenburg	6	“
“	Hanover	11	“
“	Hesse-Cassel	18	“
“	Hesse-Darmstadt	7	“
“	Saxony	15	“
“	Weimar	3	“
“	Oldenburg	1	“
“	Brunswick	5	“

From	Anhalt	1	Professors
"	Nassau	1	"
"	Hamburg	2	"
"	Frankfort	9	"
"	Austria	5	"
"	Bavaria	17	"
"	Württemberg	4	"
"	Baden	12	"
"	Alsace	0	"
"	Switzerland	3	"

It is interesting to note that more professors emigrated from the city of Frankfort into the German Empire and into Switzerland than, for instance, from Austria. Three Germans came into the country from places outside the German states; one from Russian Poland, one from England (both of these are at Jena), and one from Hungary (at Vienna).

Very interesting also is the distribution of the Austrians from the different crown lands among the professorships. Of the sixty-eight places that Austrians hold at German universities,

27 are occupied by Bohemians (counting the Moravians and the Silesians there would be 34, or one-half of all the positions).
15 by Lower Austrians
7 by Tyrolese
5 by Moravians
3 by Carinthians
2 by Upper Austrians
2 by Styrians
2 by Silesians
1 by a Galician
1 by a native of Trieste.

The nationality of three of these I could not discover. The great preponderance of Bohemians (most of these are German Bohemians, Bohemian Franks, only a few being Germanized Czechs of the first or second generation), and then of the Lower Austrians is doubtless the result of the influence of the Universities of Prague and Vienna. Besides, the German Bohemian and the Upper Austrian seem to excel the other races in energy, diligence, and a talent for observation, while the Lower Austrian excels in imagination and in the ready adaptability of his talent. It is worth noting that Gratz has not induced more Styrians to undertake a university career.

Mingling of Racial Stocks.—In stating above that a mingling of personalities from various German stocks and an occasional exchange of these is, generally speaking, of great value to research and teaching in a faculty, I do not wish to be understood as saying that it would be impossible to compose a faculty entirely of natives, which would accomplish good results in both directions. In Prussia, in the sixth and seventh decades of this century, the policy was in high favor of not promoting young men at the places where they had served their apprenticeship, but to wait until they were invited by other faculties, and even then to take plenty of time to consider whether they should be retained, or whether it would be better to recognize them only after they had proved their worth in an outside position. In Berlin the career of a lecturer was altogether hopeless. Every lecturer who was impelled by personal circumstances to obtain his first appointment in Berlin knew that he would never be promoted there, and that he could not count, even after twenty years of the most indefatigable work, on getting the title of adjunct professor. The result was that the Berlin lecturers were compelled to make every effort to attract attention as writers and as research workers so that they might be called to other universities.

The Berlin faculty was exceedingly strict; "it let no one get ahead," as the younger men said, and in this the faculty was supported by the Ministry. This was at a time when the rush to get into the service of the state was so great that the Minister of Justice issued a warning each year urging men not to study law, and when an affidavit was demanded of each person who wished to enter the public service as a lawyer, to the effect that his private fortune was sufficient to support him for ten years without any salary from the state. The drift into the public service went too far; the schools produced more power than the machinery of state needed. Then in the last decades certain safety-valves opened up, through which the surplus energy was diverted into industrial undertakings.

In the medical profession this distribution was brought about by giving physicians the right to settle wherever they pleased in their own country, after the reservations for the lay surgeons were abolished. Then followed the right to practise in any part of the North German Federation, and finally the freedom of the whole German Empire. This in turn brought about an enormous increase of the number who studied medicine. Judging from the larger number of adjunct professors in comparison with former days, the authorities at Berlin are now less rigorous in applying the principle of not promoting the younger local instructors. Formerly the adjunct professors were wanted only where their teaching services were needed at low cost. Now the adjunct professorship is conferred as a recognition of scientific achievement upon those who have earned distinction in the subsidiary subjects. If this is done on the initiative of a faculty, it constitutes the highest recognition that a lecturer can receive. I can approve of the practice only when the title is given to the right person, and not too frequently; but I should prefer the granting of the title of "honorary professor." When such recognition is given, it should never be allowed to encourage the claim among those so distinguished, to be the next in line if a vacancy should occur in the council. A person may have written most excellent, even notable books, and may have earned great fame for himself and the university, and still be unfit to be a departmental head. For this position a certain degree of versatility of talent, interest and culture are needed. There are many people who are talented in one direction and yet in all others have a very limited horizon.

Austria.—As for the mingling of German racial stocks in Austria, fewer men from outside the country are needed to bring about a suitable mixture than was the case in the German countries of 1866. The racial groups within the Austrian Empire present the most variegated types and in consequence of the very different constitutions of the various crown lands, the intermingling of these groups never became so intimate as, for example, among the stocks in the Kingdom of Bavaria. The German Bohemian and the Styrian, the Austrian Silesian and the native of Vorarlberg, the German Moravian and the Tyrolese differ at least as much (and speak dialects that are as different) as, for example, the Saxon and the man from Württemberg, or the Hanoverian and the Bavarian. It would be to the advantage of the Austrian universities if there were a more active interchange between them and the other German universities.

German chauvinism, fear of which is expressed in the annual report of the Austrian Ministry of Education for the year 1874, I have until now been unable to find in the German Empire either among the professors or the students. There is no real soil for chauvinism in Germany. It will, however, be artificially created in Austria if the Austrians do not stop making experiments to separate German Austria from the German nation by fomenting discord. In the Austrian Parliament German is spoken, with rare exceptions; German is the official language in Austria, and in conjunction with Esthonia, Courland, Livonia, Switzerland and Transylvania, Austria can easily rival the German Empire in the extent of its territories, the number of its inhabitants and in the scale of its civilization. Of course every factor that cannot be reconciled with the laws of the state must be eliminated from the Austrian universities, since they are state institutions; but the prosperity of these institutions and their effect on the intellectual growth of the nation depend more upon the achievements of the men who direct and serve them, than on the accidental circumstances that the latter happened to be born within the boundaries of the Austro-Hungarian monarchy.

One of the most prominent and brilliant professors at the University of Vienna, who is at this time a minister of the state, has expressed this idea so forcibly (1869) that I cannot refrain from quoting his words. He said: "If the organization of the University of Vienna is to be accomplished in a manner commensurate with present-day educational demands, it must proceed from the fundamental idea that in the first place the university must serve neither the church nor the state, but science. If science was at first subject to the church, and later to the state, it has now gained its independence, in the sense that it must define its own aims and choose its own path. It begins with doubt, in order to end with knowledge. A university in our day must champion knowledge, independent of church and state—it must uphold the function and destiny of science as an end in itself.

"The university remains a state institution in the sense that it is supported, protected and supervised by the state. It must, however, administer its most important and intimate affairs altogether autonomously. The university must therefore have neither an ecclesiastical nor a governmental coloring, but must be purely scientific in character.

"To be sure, the teaching at the university of doctrines inimical either to the state or to religion is to be prevented, and it is precisely this supervision that should be in the hands of the state."

This Austrian statesman saw nothing to fear in German science, —and there has been no other science at Vienna since the beginning of this century. Nor did he fear the professors, for he knew the power of the state to protect itself.

An Austrian military man and patriot, the author of "Contributions to our School and Educational System" (1875), is, however, in such mortal fear of the German professors and students that he would like to build a wall around the country and let no one go either out or in. There, within his artificial encirclement, he sits, proudly comfortable, and enchanted with the consciousness of his patriotism. He must assert his particular brand of patriotism many times a day to all who pass by, else those who have allowed themselves to be immured with him might not believe in it. This separatistic Austrian patriot, whose positive proposals promise to prove about as durable as the canons of Uchatius, will surely not be so presumptuous as to claim that he is more patriotic than was Emperor Joseph II, who wrote to his Minister Blumegen, in a document already cited: "We should accept the best that the different foreign universities have devised and should endeavor from time to time to bring skilled professors into the country."

The Power of Appointment.—How are the vacancies that may occur in the teaching bodies to be filled? Who is to choose the successors, the government or the faculty?—for that the actual appointing can be the function only of the authority which pays the salaries, namely, the state, is self-evident. The question, therefore, must be framed as follows: Shall the teaching force as such be allowed any legal influence in filling its own ranks, and how extensive shall this influence be?

It cannot be denied that this is a very difficult question, nor that it is the cause of most of the differences between the faculties and the government. The former like to hark back to an ancient privilege, the so-called "right of presentation," although there is not always proof that such a right existed. My sources for the study of this question were adequate only for the University of Vienna.

It appears that at the founding of the universities there were no departmental professors in the modern sense of the term; there could not, therefore, be vacancies in the departmental positions. All doctors had to teach for a time, and had to hear recitations and disputations, in the manner and at the time determined by the head of the faculty. Whoever was solemnly declared to be a "doctor" by the faculty was thereby proclaimed a scholar, and was not only invited, but obligated to teach. If the state permitted the existence of such an institution, which in a sense paralleled the knightly orders, the clerical orders and the guilds, it surrendered by that act the right to influence the choice of the teaching personnel. Accordingly, when Duke William, in giving a subsidy (July 4, 1405) to the financially hard-pressed university, assumed the right to appoint the teachers of the three higher faculties, he committed an act that was in itself a violation of the university constitution. The choice of teachers in the Faculty of Arts was left to the ducal council.

After the reforms of January 1, 1554, when the university had become purely a state institution, the appointment of the teachers by the state should logically have followed. Ferdinand not only did not assert this prerogative, but he even surrendered the right, retained by his predecessors, to fill certain positions. A closer analysis of the paragraphs of the constitution governing appointments brings to light the rules for the filling of vacant places: The rector, the superintendent and the "consistory" (i.e., the senate, but not the faculty as a whole, nor the doctors) are given authority to fill any vacant instructorships, "provided, however, that whenever a new professor is to be thus chosen by vote to fill a vacancy, the candidate for the position must either be a man of acknowledged reputation as to scholarship, or must be subjected to a most careful scrutiny and examination in order to determine his fitness for the place. We therefore order that appointments to lectureships be made and assigned in such manner that invariably the man best fitted to fill the position be chosen, and that such choice be entirely uninfluenced by personal favoritism or bias within faculty circles." This passage is interesting, inasmuch as the government even then quite clearly understood that the freedom of the universities to dispose of their positions might easily lead to personal intrigues and to nepotism. The state therefore retained the following apparently innocent veto-power "and that candidates for new appointments may always be recommended to the chancellor and the council, who will thereupon approve the nomination *unless just causes for refusing such confirmation, or other legitimate impediments, be found to exist.*"

This clearly indicates that the state (in those days the sovereign) always retained the final right to confirm or to reject through his agents the choice of the university authorities. It has never been hard for an official or a council to find a "just cause for refusal" or a "legitimate impediment." Even if one should choose to ignore everything that happened later, it would still be impossible on the basis of this document to establish the contention that the University of Vienna, as long as it was a state institution, had ever had the right to fill its vacancies unhampered by any conditions.

It does, indeed, seem to have been the *usus,* or custom, for two centuries for the government invariably to endorse the nominations made by the faculty. Had this not been the case Gerhard van Swieten could not have spoken, in his often mentioned letter to Maria Theresa (1749), of an *abusus.* He was often attacked, especially by the Doctors' Council, which even then was obsolete, on the ground that he had persuaded the Empress to abolish this old privilege of the university. The passage of his letter here in question reads as follows: "As for those who teach, the professors, until recently the university has chosen them. This is an abuse, for this right undoubtedly belongs to the sovereign, who in this case may ask the advice of the university authorities, but who should not leave to them the absolute power of choosing the professors, since the consequences are so momentous." Van Swieten knew the conditions then prevailing at Vienna so well that he saw the impossibility of reorganizing the medical faculty if he did not have absolute power to begin with; he therefore abandoned the old principle as useless. Enlightened absolutism has until now always brought about the greatest cultural reforms in Austria; moreover it is a well-known fact that no corporation has ever been known to reform itself from within. I can therefore only approve Van Swieten's course in this instance. When later he made his principle more general and extended it to the other faculties, he had other considerations in mind.

The Jesuits, who on the whole were favored by the Empress, had gained so much ground at the university that they controlled not only the theological faculty but also the faculty of arts. By applying the principle stated above, their unlimited influence in filling vacancies could be forestalled or at least minimized by the state. It has already been related how in later days Directors of Studies were introduced in all the faculties, and how these officials had everything in their own hands and could fill all places themselves. In appointing Gottfried van Swieten President of the Court Commission of Education, Joseph II limited the supreme power of the Director of Studies by making the choice of candidates dependent on competition. He writes: "The greatest care must be taken in filling the teaching positions, and the best choice must be made irrespective of nationality or religion; and all positions must be filled competitively, except where men of great ability and international reputation are concerned."

Martini.—Under the complicated arrangement of the Committees on Curriculum which Martini created in 1790, the teaching bodies were once more given a somewhat larger influence in filling vacancies. In the Court Resolution of November 18, 1790, inspired by Martini and issued by Emperor Leopold II, we read that through the newly created Committees on Curriculum arrangements should be made "that above all, the public teachers should be given permanently the influence that is due them in internal school affairs. In future nothing of importance should be undertaken by the authorities without their knowledge and without consulting them, and each teacher shall have the right to express his opinion concerning the schools and the course of study, to complain about such shortcomings and faults as are evident to him, and to put his ideas for the improvement of the schools before his superiors." Among the functions of the Committee on Curriculum, which was composed of members of the teaching body, a special point is made of the nomination of eligible teachers.

This approach to a somewhat wider sphere of activity on the part of the teachers did not last long. As early as 1802 the omnipotent Directors of Studies had been reintroduced. They remained in power until the adoption of the University Law of 1849. For exactly one hundred years, then, the teaching staffs as such had no legal right to fill vacancies. They could exert their influence only in so far as individual members of the *Collegium* were able to influence the Director of Studies.

By an imperial decision of April 24, 1828, it was ordered, "that without the consent of the Emperor, no foreigner shall fill any teaching position whatever, at any school, even provisionally." In consequence Austria refrained on principle from inviting foreigners —precisely the practice that was considered so advantageous by Emperor Joseph II. The consequences of this order were the more deplorable, inasmuch as all universities in German Austria, except Vienna and Prague, were closed. Brücke and Bonitz were the first foreigners to be called in disregard of this law, in the spring of

1849, during the Ministry of Stadion and at the suggestion of Councillor Exner, whose services to the university were very great.

Exner was the author of the University Law of 1849, which in my opinion was much too liberal and impractical in the organization of the teaching force. The law was issued during the Ministry of Leo Thun, on September 30, and has for the last twenty-six years been known as a "provisional" law! The third paragraph reads as follows: "The Deans shall take the place of the Directors of Studies, whose office ceases to exist." Paragraph 19 further provides that "the relation of the deans to the professorial council is determined in general by the relation of the Director (at Vienna the Vice-Director) to the body as set forth in the most recent orders." From this we might infer that in filling vacancies, even recommendations to the Imperial Educational Commission or to the Ministry of Education and Public Instruction (which had been formed in the meantime) must have emanated solely from the deans of the faculties, thus giving them the same absolute personal control over the composition of the faculties that was formerly exercised by the Directors of Studies. That this interpretation is not correct is evident from a Ministerial decree which I shall quote later. This decree appeared on December 11, 1848, and was in a sense the first gift of liberty to higher institutions of learning. The deans have been allowed to retain at least a remnant of the prerogatives of the former Directors of Studies, in that they are usually asked to carry on the negotiations with the prospective candidates for vacant positions.

In the Ministerial decree just mentioned, which is still "provisionally" valid, "in which provisional measures are prescribed to regulate the filling of vacancies in the teaching force at universities, lyceums, *Gymnasien,* technical institutes and other secondary schools" we read, Paragraph 1, that "the recommendation of a candidate for a vacant position must come from the teaching staff of the institution at which the vacancy exists and is to be reported to the Ministry by the head of the provincial government. In each case three names are to be proposed." Paragraph 2 provides that the nominees "may be actual teachers, professors or lecturers at domestic or foreign schools." The Ministry causes the position to be advertised by the head of the provincial government (the governor or the president). All applications received, together with the testimonials, are submitted to the teaching staff. Paragraph 4 states that "the teaching body may propose men who have not applied. In this case it must first privately inform itself whether and under what conditions the person so invited will accept the call." Despite the autonomy which it grants, this paragraph is very dangerous to the faculty, as well as impracticable. The Ministry puts upon the faculty the entire burden of carrying on the correspondence in connection with the vacancies, but must, of course, retain the right to overrule its decisions; and when this happens, it invariably creates a painful situation for those who were detailed to conduct the negotiations (i.e., the dean, or the Faculty Committee on Vacancies). In Paragraph 7, competition is permitted in exceptional cases.

We have, then, advertisement of the positions, consideration of the applicants by the faculty, correspondence by the faculty with the man to be appointed, and in some cases competition and selection from among the competitors. After all this comes the nomination of three men, and in the end the Ministry may overrule the choice of the faculty. A great many faculty rights and duties, indeed, but little prospect of accomplishing anything with them!

We already have before us more than enough data on which to base a general discussion of the matter, but before doing so let me report what I have discovered in this connection in the statutes of other German universities.

Dorpat.—Paragraph 41 of the statutes of the University of Dorpat of the year 1865 reads as follows: "If a chair becomes vacant, the faculty in question shall present to the council (an assembly of the full and adjunct professors under the chairmanship of the rector) the name of the candidate chosen by them to fill the vacancy. But any member of the council has the right to propose a candidate, giving his reasons for such proposal in writing. Upon motion of the council the names of the candidates are inscribed in a book kept for the purpose (the presentation book), and at the end of seven days a vote is taken and the successful candidate is presented to the Minister of Public Education for ratification."

Paragraph 48: "The professors, after having been chosen by the council, are ratified by the Minister; the lecturers and the other officers of instruction by the curator. If a vacant teaching position at the university is not filled in the course of a year by a candidate chosen by the council, the Minister can of his own accord appoint any person who fulfills the requirements demanded of a professor. Besides, the Minister may at any time appoint as extra-budgetary professors persons who have distinguished themselves by their scholarship and their teaching ability, provided they meet the other requirements for a professorship."

If these paragraphs are enforced literally, and the Minister has confidence in the faculty, the influence of the latter may become very great.

Switzerland.—In Switzerland this matter is variously regulated at the different universities. Professor Socin was kind enough to write me the following about Basel:

"When the university was founded in 1460 it received among many other privileges and liberties the right to fill vacant teaching positions, with the condition, however, that the candidates be chosen from among the most able 'and among those toward whom the chancellor, the rector, and the council may not entertain reasonable displeasure.' After the Reformation, when the university was reorganized (1532) and secularized, it retained the right to govern itself, but the elections of new professors had to be put before the government for confirmation. There seem to have been no changes in this regard until the law of June 17, 1818, under whose provisions the right of the university to fill its vacancies was lost and transferred to the newly organized Board of Education. Paragraph 11 of this law orders that all full professorships and teaching positions shall be filled after public advertisement and competition. But the council is given power, 'in cases where it would be to the advantage of the institution,' to call and appoint professors without previous competition, at the recommendation of the Board of Education. The latter method has become customary, and public announcements have never, or very seldom, been made. The rector and three full professors are included in the membership of the Board of Education.

"By the same law of June 17, 1818, the University Curatorship was set up, which was to transact business and to have charge of the university funds. It consists of the president of the Education Board and two curators chosen from among the members of the Board, and elected by the latter. The president has the title of chancellor, and is a member of the council. (He is, as a rule, one of the two mayors.)

"In 1883, after the separation from Basel-Land, this law was changed, so that the Board of Education, now the Council of Education, consisted of three faculty councillors and seven members elected by the general public. Professors and rectors now received scant consideration. The curatorship was to consist of a president, chosen from among the three faculty councillors who were members of the Council of Education, of another member of the council and of three citizens.

"The law now in force dates back to June 8, 1863. According to Paragraph 56 of this latest law the curatorship consists of a president chosen from among those members of the Educational Council who are aldermen, and four other members who are chosen from among the general public.

"In appointing teachers it is now the custom for the curatorship, before making its decision, to invite individual members of the faculty to make suggestions, or, more rarely, the faculty as a whole is consulted. But it does not possess the *right* to make recommendations.

"On the whole I think this system works very well, because it prevents the growth of cliques and intrigues in the faculty."

The law of the Republic of Bern, March 14, 1834, "on the higher *Gymnasium* and the University," which is still in force, provides as follows:

Paragraph 40: "The adjunct professors are chosen by the government after nomination by the Department of Education, from among lecturers abroad or at home. The number of adjunct professors will be fixed by the government at the recommendation of the Department of Education."

Paragraph 42: "The full professors are chosen by the government at the suggestion of the Department of Education, as a rule from among the ranks of the adjunct professors; in exceptional circumstances other distinguished scholars may be called to these chairs. Lecturers, however, or men whose teaching ability is not sufficiently well known, shall, before their appointment as full professors, serve for a probationary period as adjuncts."

As for the Canton of Zurich, I know that every vacant professorship had to be advertised by the Board of Education, that the applications received were referred to the faculty in question for their consideration, that at times the faculty was asked for its opinion of men who had not applied, but whose names the Board had referred to the faculty. The faculty was also allowed to suggest men who had not applied. This often entailed an enormous amount of work for the faculty in formulating recommendations, to which the Board of Education was, however, in no way bound to give special consideration. And in the Republic of Zurich it sometimes happened that men whom the faculty had most emphatically rejected, were appointed at the instance of foreign scholars in whom the president of the Board of Education at the moment had complete confidence. *Precisely as with us!* The General Educational Law of December 23, 1859, for the Canton of Zurich, reads as follows (Paragraph 131): "The government elects the professors of the university on the recommendation of the Board of Education, after obtaining the opinion of the faculty concerned." In the university regulations of September 14, 1864, we read (Paragraph 29): "The opinion asked by the Board of Education in the matter of the appointment of a professor or lecturer (Paragraph 131 of the Educational Law) must be given by the faculty to the rector, to be transmitted by him to the Senate Committee. The faculties have the right on their own initiative to draw attention to persons who would be especially fitted to fill a professorship; but such suggestions shall not be combined with the aforesaid expression of opinion."

German Empire.—In the German Empire there are also many variations in the so-called right of presentation.

Alsace.—The statute now before the Imperial Chancellery, the enactment of which in the near future is expected, states, in Paragraph 8, that "Every faculty is responsible for the completeness of the instruction in the subjects within its jurisdiction. It is therefore in duty bound, when vacancies occur, or when for other reasons the curriculum cannot be completely taught, to report this fact through the curator to the Imperial Chancellor, giving reasons, and making the necessary proposals to fill the vacancy. At the same time this memorial of the faculties is to be communicated to the senate."

Baden.—There is at the moment no complete, consistent and altogether valid statute for the Universities of Heidelberg and Freiburg.

Professor Becker of Heidelberg writes as follows: "The faculty has no legally defined influence in the matter of filling vacant teaching positions." From Professor Czerny of Freiburg I have the following information: "The custom of the university in filling vacancies is as follows: the man leaving the position to go to another university (or in case the vacancy is due to the death of the incumbent, a professor holding a place more or less closely related to the field in which the vacancy has occurred) makes a report to the faculty concerning the available men who might possibly be nominated, and this body agrees on a candidate, or it may name others who might be considered. The report, with the documents, is brought before the senate (if the case is urgent, only before the prorector) and this body sends the report to the Ministry, which now opens negotiations with the candidate, usually after a confidential, indirect inquiry conducted by a member of the faculty."

Württemberg.—The order of business of the academic senate of the University of Tübingen of May 5, 1832, indicates among other things the following as coming within the jurisdiction of the senate: 1. Approval of the establishment of new teaching positions, determination of the scope of the existing positions, and approval of the combination of several positions, hitherto existing separately. 2. The making of nominations for the filling of vacant teaching positions, and approval of the applications for the position of lecturer."

Bavaria.—Here, too, the old laws of the university have not yet been codified in a consistent and altogether valid statute. There is no set legal provision for the participation of the faculty in the filling of vacant teaching positions.

I have received the following information concerning Munich: "The filling of teaching posts is, without condition or limitation, the right of the Crown. On nomination of the faculty the senate recommends a candidate to the Ministry. As a rule the appointment follows as a ratification of the nomination, but not always."

From Würzburg I have the following report: "I know nothing of any legal provision for the participation of the faculty in the filling of vacant teaching positions. The custom is very definite. The faculty proposes one or more names to the senate; this body has the right to modify the proposals, and lays them before the Ministry. Naturally the Ministry may do as it pleases. I know, however, of no case where it has disregarded the nominations of the faculty. In all cases with which I am familiar, the Ministry has appointed the first choice of the faculty."

The following note came from Erlangen: "In the Laws and Statutes of the University of Erlangen of January 1, 1748, we read, Chapter II, Paragraph 5: 'When a professorship becomes vacant, there shall be nominated by the university two candidates whom the faculty in which the vacancy exists has judged to be best fitted for the position.' In recent years there have been many departures from this rule. For several years the medical faculty has invariably presented one candidate, with the statement that another so well fitted for the position was not to be found. The other faculties have occasionally proposed more than two candidates. The Ministry as a rule has appointed the sole candidate suggested by the medical faculty, as well as the first on the list of candidates of the other faculties."

Hesse-Darmstadt.—A basic constitution for the University of Giessen has been worked out only in recent years. According to Paragraph 9 of this law, "discussion and decision in cases of the appointment of academic teachers, the appointment of adjunct professors and the granting of the right to teach, belong within the jurisdiction of the senate as a whole."

A colleague has written me about the system prevailing at that university: "In the case of appointments, the faculty, after hearing reports, usually nominates three candidates; then the matter comes before the senate, which listens to the report of a committee of one or two, and then usually decides as the faculty has desired, and puts its recommendation before the Ministry. The Ministry usually selects the first among those proposed by the senate, although sometimes even the third name is chosen. On rare occasions it ignores the proposals of the senate altogether and chooses entirely on its own responsibility."

Hesse-Cassel.—The conditions at Marburg are similar. I have no specific information about the right of presentation of the faculties.

Hanover.—I have received the following notice from Göttingen: "The faculties have no legal right to participate in the filling of vacancies." In the Professorial Manual for the University of Göttingen I find no regulations at all to cover the filling of a vacancy; nor, to be sure, is there any provision against faculty proposals to this end. As long as Göttingen belonged to the Kings of Hanover the faculty as a body was not consulted in case of vacancies. That matter was in the hands of the curator, who had his confidential advisers in the faculty.

Mecklenburg.—The Statutes of the provincial University at Rostock of 1837, contain a paragraph (110) entitled "Choice and appointment of full professors" which reads as follows: "The procedure in making nominations for the appointment of full professors shall be as follows: The faculty in which the vacancy exists, shall, within eight weeks after the death or the discharge of the incumbent, propose to the whole council six names. These six names are to be presented to the rector by the dean in a memorial signed by all the members of the faculty, setting forth in brief the reputation and the achievements of the nominees. No member of the faculty may, if the decision of the faculty has been arrived at by a clear majority, simply refuse to sign; it is the duty of the dissenting member, inasmuch as he hesitates to sign the memorial, to report and present the reasons for his disagreement to the rector in a memorandum which must first be read to the faculty. The rector shall then immediately call together all members of the council, with the exception of the dissenting members of the faculty just mentioned, appending to the call the memorial of the faculty. In the council session the three most eligible are to be chosen from the list of six, and the reasons for the preference above the others in the memorial are to be recorded; then the documents are to be sent without delay to the government, which, however, is not limited, in making its choice, to the men so nominated. The council is free to recommend any scholar for consideration by the government in filling the vacant professorship, for reasons especially set forth." To this was added in 1840 the following: "The rector and the council of the University of Rostock are herewith requested in the case of a vacancy in a full professorship at that university, not to proceed with the choice of a candidate under Paragraph 110 of the statutes, until the government has determined whether, when and in what manner, in consideration of the field in which the professorship lies, it is to be filled again; and in future the meeting of the faculty council for the purpose of making the selection shall not be held sooner than at the end of three weeks after the nominations of the faculties are handed in."

Holstein.—Whether, in the matter of filling vacant professorships, the University of Kiel had any special rights under

Danish rule, and whether the Danish government was bound by such rules, I do not know. The new Prussian provisional statute of 1874 contains no reference to the point.

Weimar.—I am not informed as to the right of presentation at the University of Jena.

Saxony.—The new statute of the University of Leipzig of March 29, 1871, contains no mention of the right of the academic authorities to make nominations.

Prussia.—Until 1866 there was no general university statute for the Prussian universities, nor did any such statute come into existence after that. It is characteristic of all the old Prussian universities that the right of presentation is given not to the senate (as at most other universities of the German Empire) but to the faculties directly: the senate has no voice in the matter. Concerning Breslau and Halle I can only say that in the university statute for Halle, 1854, the question that concerns us at this moment is not touched on, and that the faculties of these two universities have, as has been reported to me, no faculty statutes.

The statute of 1834, for the University of Bonn, promulgated by Von Altenstein, is the basis of the modern Prussian university constitutions.

Paragraph 37 of the statutes of the medical faculty reads as follows: "If one of the full medical professorships, recognized in Paragraph 35 of the University statutes, should become vacant, the faculty is permitted to suggest to the Minister, through the curator, three eligible men." In the statutes of the medical faculty at Berlin, 1838, Paragraph 45 reads as follows: "If a regular professorship is vacant the faculty is permitted to propose to the Ministry three men suited for the position, giving reasons in full in writing."

Paragraph 22 of the statutes of the medical faculty at Königsberg, 1854, reads: "When a full professorship is vacant the faculty has the right to suggest to the Minister, through the curator, suitable men, giving reasons for these proposals." The paragraph on this point in the statutes of the University of Greifswald, 1861, is framed in very decided and vigorous language. It is the only one among all the paragraphs cited in which the word "right," so carefully avoided elsewhere, occurs. Paragraph 27 is entitled "The duties of the faculties in the matter of making the course of study complete." Paragraph 28 is called "The rights of the faculties in view of these duties." The second section of this paragraph reads as follows: "Each faculty has the right and the duty, in case of vacancy in a full professorship, to report to the Minister the need for an appointment to fill the place, and in case the Minister should request it, to nominate two or three able men, giving reasons for their selection."

The question of the influence of the faculties as a whole on the filling of vacant chairs in the council has such extraordinarily far-reaching implications, and there are so many diverse opinions about it, that I have spared no effort in making the foregoing compilation of official enactments. This seemed the more necessary since each university is prone to think that its sister university enjoys ancient privileges in this respect, and most faculty members entertain curious notions of old and new rights of presentation which, they fancy, are being arbitrarily violated by the Ministers.

It appears from this compilation that an unconditional autonomy of the faculties in the filling of vacancies, with the implication that the Ministry, and in the final analysis, the sovereign, had completely divested themselves of their right of independent action, has never existed anywhere. Such a condition would indeed be incompatible with the concept of the university as a state institution. It is possible, at least in form, only when the sovereign is himself the rector of the university and therefore a member of it: a beautiful custom, honoring the sovereign no less than the university!

Examining the question itself, to determine how it works out in practice under present-day conditions, we must at the outset exclude from consideration the person of the reigning sovereign, as well as of the Minister, who, although he is the responsible administrator of educational affairs, is often quite hazy about university matters. As a matter of fact, the entire responsibility falls on those men in the Ministry to whom the welfare of the universities is entrusted. These men are charged with an exceedingly difficult task, and one which for them personally would be almost impossible of solution. They must possess, first of all, an inner urge and an enthusiasm for their duties, a high degree of general culture, an all-embracing and discriminating knowledge of men, a sure eye for talent and genius, a clear conception of the aims that are especially urgent at any given time; experience in organizing and executive work, and a clear and certain understanding of the principles and means by which they can accomplish their high undertaking. Wherever sure and intelligent leadership with definite aims is apparent in all the decisions of the authorities, even the most perverse individuals among the professors will give in, and will at least respect what may be in the highest degree objectionable to them personally.

The Minister in Charge of Universities.—It is not at all necessary that the man at the head of university affairs be a universal genius or even an allround scholar. An attempt in this direction would be foolish, for any specialist in any field would be able to discredit such pretensions with ease. Nor would it be more practicable for the official in charge of university affairs to encumber his office with the dead weight of a permanent consulting expert. When an able university commissioner has grown old in the service of the Ministry, he will, to be sure, lose his energy and efficiency, but he will still retain his great experience and his extensive knowledge of business and of people. It is easy, too, should he become useless, to remove him to another post with a higher official standing, where he will do less harm. But if we put an expert, a scholar, into the Ministry, and he grows old, it is hard to get rid of him without hurting his feelings. A scholar who is at the same time a man of character cannot, in my opinion, maintain himself in such a position for any length of time. In such a place he is the official expert appointed by the state, the official authority above all authorities. If one of his important proposals is declined by the university commissioner, or by the Minister, there is nothing left for him but to hand in his resignation; and he would have to do the same thing if the Minister made some decision in his field without his knowledge. Now, no Minister can govern with the aid of such men; they are in such cases really Ministers in a measure. But if the expert allows himself to be disavowed and overruled and still remains in his position, he plays an unworthy part; he is then a man of straw. Such a rôle does not become a scholar. The university commissioner, section chief, or whatever else he may be called, must be able to choose his advisers in each case as he pleases and as he thinks useful. If he has the qualities enumerated above, he will be able to find the right people with or without the aid of the corporate faculties.

I would consider it much more to the point to withdraw the control of the universities entirely from the officials of the Ministry, and to set up a "curator," who should stand in about the same relation to the sovereign as the curator of the Academy of Science at Vienna. He ought not to be an active Minister, because he would then be compelled to go with the political currents, and the office would be subject to frequent changes in personnel, which would be detrimental to the interests which the position would represent. But he would have to hold the rank of a Minister and have the right to communicate with the sovereign directly. State officials of advanced age, men from the higher classes of the aristocracy, might make it a matter of pride to take over such posts, and to bring the university entrusted to them to the highest point of scientific efficiency, and therefore of greatest usefulness to the state. Such men ought to have exact and extensive knowledge of the personnel of the German academic world. By reason of their talent for negotiation, their attractive personality, their natural amiability and kindliness, these curators would have to be counted among the most highly respected men in the country before being entrusted with such a position. Everyone will admit that under such circumstances direct interference of the faculties in the filling of vacancies would be practically unnecessary. Through their continuous relations with the curator they could keep him constantly informed of their needs. I have no doubt at all that an enlightened absolutism, warmly sympathetic with the present needs of the country, is the form of government best suited to foster a steady development of civilization.

But the faculties wish to have an official voice in the most important of their affairs; and what is more important to them than their composition? In comparison with this all their statutes, with thus and so many liberties, are trifles. Their honor and their reputation depend on their membership. No one can take from them the odium of being unsuccessful. When the world of scholars and students declares that the faculty is weak, accomplishes nothing, attracts no students, is scientifically unproductive, in short, equal to zero, then the criticism falls on the faculty alone. No one asks who has put such a faculty together. To be sure, the Minister, as representative of the state, is responsible for this condition, but the faculty itself is alone held responsible by its sister faculties and by the world for its insufficient accomplishment. This is true of praise as well as of blame; for if a faculty prospers and its fame spreads, we hail the names of the men who work in it, while the name of the man in the Ministry who has assembled it at the cost of great effort is hardly known.

It is a thankless business to be compelled to look after the well-being of the universities in the name of the state. The Minister or secretary concerned must pretend not even to be aware that the faculties built up by him accomplish little, or that their complaints ring discordantly in the ears of the public. To heed these discords would be to admit his own incompetence. He must not even admit that his colleagues in other states have managed their jobs better than he, otherwise he would have to resign his position immediately. It is a thankless task to be compelled to look after the well-being of the universities in the name of the state!

One can easily understand why the faculties insist that it is their own good right to decide who shall fill a vacancy in their council. They should surely know better than anyone else what persons would best suit them. To be sure, it is said that the faculty members constantly intrigue, that they wish to admit only inferior men, so that their own light may not be dimmed; that a great many personal matters are thrust to the fore, and that the question in hand is not considered on its merits. It is asserted that voting is always a doubtful procedure in matters that have to do more with authority than with majority.

Of course, if we are always to proceed from the lowest estimate of human nature, we may say the same things of the influences at work on a curator, or on the university commissioner in the Ministry. Is either of these immune to personal influence? Have they not friends who wish to influence them in favor of their friends? Are they not subject even more to political and social pressure from above, from below, from all sides? If one is bound to see intrigue, cliques, nepotism everywhere, why need it be supposed that these things are commoner in the faculty councils than in the bureaus of the Ministry?

Against giving the faculty an official influence it may be urged that the council, after the departure of one specialist, is not itself in a position to give an expert opinion on persons suited to fill the vacancy. The remaining members are obliged to gather information from other experts in the field in which the vacancy has occurred. They may be badly advised, or even deceived.

In answer to this it may be stated that the members of the council may be trusted to have more personal acquaintances among scholars than most university commissioners, and that the latter must also consult other experts for their opinions.

If a faculty has two professorships in a given field, so that after the departure of one expert there is still one left, it is the usual thing to suspect this man of every sort of meanness, envy, jealousy, pride, brutality, contempt and tyranny toward his future colleague. Such a man, with the best of intentions as to the welfare of his institution, might nominate a god for the vacant chair, and still not escape calumny.

Nevertheless, the difficulty which the Minister faces when he is compelled by law to approach the faculty for proposals does not consist in these things, but rather in the official character of such nominations, in the pressure that is thereby put on the government. If the university commissioner permits a German expert to make suggestions to him, if he confers with various persons or conducts an extensive correspondence with a large number of scholars, it surely should not surprise or hurt any individual among those consulted, to learn that still others had been called into consultation; any more than it should surprise or hurt a doctor to learn that a person who felt very ill and wished to do all he could to escape a prolonged and serious sickness, has out of his great fear and his anxiety for his family consulted not only many other physicians, but even some quacks. The individual consulted has no share in the direct responsibility, whereas the one who does the consulting takes all the responsibility for the decision upon himself. He will often be right, if the opinions of authorities and majorities agree; then again, like all human beings he may make a mistake.

At first glance it would seem as if the university commissioner or curator could not meet his responsibility in any better manner than by asking the council itself for its advice. It is the authority which the state has itself created and composed. If the state disavows the council, it admits in so doing that it has no faith in the body of scholars which it has itself created; that it has put into it untalented or otherwise useless individuals, or that the statutes by which this body must function do not express the true opinion of the corporation. But if he does ask this learned body, constituted by the state or possibly by himself, he is, in my opinion, morally bound to abide by its decision. He would destroy its authority as a scientific body, its authority over the students, and its authority in the eyes of the sovereign and the general public, if he were to influence the Minister to decide otherwise. If the commissioner has asked the advice of a corporation composed of men whom he has himself designated before all the world as the most intelligent and the most learned, he cannot afterwards consult individual experts—who may perhaps have seats in the bureaus of the Ministry—without deeply insulting the faculty (a matter which may be of small personal concern to him), and thereby publicly injuring its authority and therefore the authority of the state itself.

There is much talk about the easily injured vanity of the professors and the council, but that is beside the point. If the members of a faculty have taken honest pains, with the advice and the help of the best German scholars in whom they have confidence, to give as complete a report as possible of their opinion in the filling of an important teaching post, upon which the welfare of generations may depend, it is not their vanity but their honor as men of science that is involved. If that honor is lightly regarded by the advisers of the government it is secretly or openly resented. If it happens frequently, some of them become embittered or apathetic, then follow anger, discontent, laxity and ill-will toward their work and toward the government.

If the faculties were composed entirely of men financially independent, as really ought to be the case; of men who do not need the state as a means of livelihood, but who render the state a greater service than themselves by devoting themselves to teaching, they would in such cases resign in a body.

But no Minister could work with corporations holding such principles. If every mistake of his commissioners were to become a faculty issue, he could govern no university. The university would become as autonomous as a Ministry of a constitutional state. But it is even harder to create faculties which remain vigorous and retain their permanent brilliancy than it is to create Ministries.

No matter from what angle it is viewed, this is a difficult situation. Where mutual confidence exists all is well. But if the university commissioners and the professors look upon each other as constitutionally obstinate, short-sighted and narrow, stupid or malicious, or both, then mutual understanding is made exceedingly difficult.

Procedure.—It would not be at all impossible to formulate a rule for the procedure of the faculty. The paragraphs cited above furnish a sufficient choice. For political and administrative reasons it is not feasible to bind the government legally to the decision of the faculty. In my opinion it is the duty of every member of the faculty to respect the decision which the majority of the faculty has reached and to desire its execution in the interests of faculty authority, no matter how much he personally may be convinced of the inexpediency of the system, or even of its harmfulness in certain cases. He must always bear in mind that he is only one individual, and that corporate rights cannot be exercised in any other way than through the decisions of the majority. He cannot, however, be prevented from holding a private opinion of his own, and from expressing it in private. It is passing strange that modern democracy has burdened itself with these medieval guild rights and is enthusiastic about them. Governments may do well to yield, for political reasons, in cases where no harm can result; but it is hard to find the proper method in those cases where the government must exercise its arbitrary authority. In my opinion the university commissioners, if they feel impelled to ask the faculty for advice, ought to insist rigidly on the endorsement of the nominations of three men for every vacancy in the council, and ought to return every report as incomplete which departs from this legal prescription.

In Prussia this is the rule, but not in Austria. In view of German overproduction of teachers in most fields of natural and medical science, every faculty ought to be able to propose for each full department at least three able men. It is the duty of the university commissioner so to arrange things that he can get in touch with a few confidential advisers in the faculty, *before* the faculty makes its nominations. If there is mutual confidence, or even mutual respect, it is easy to avoid friction. Just as a Ministry must be so firmly established in the confidence of the parliament and the sovereign that it has the support of responsible public opinion, so the university commissioner must possess the confidence of the Minister and the councils of the professors in such measure as to have the support of public opinion among scholars.

Communication between the faculties and the representatives of the Ministry, or between the former and the curator, must always be direct, as it still is in Vienna and has been since the days of Van

Swieten. This is the case at most of the universities of the German type. The reference of faculty nominations to the senate is too tedious and impracticable. The handling of university affairs by provincial or national governments causes too much delay; this method must be entirely abandoned. Where two Ministries (the Provincial Boards are everywhere under the direction of the Department of the Interior) collide in their functions, there is usually friction. Each official wishes to show that he and his Minister actually dominate the situation. All government officials are at heart the natural sworn enemies of the professors. I can readily see why.

As for Viennese conditions in particular, in the course of time much unrest and dissatisfaction have arisen in this regard, because of the change in the form of the university government and the attempt to introduce intermediary parties, or advisory councils, so that it will require some time to stabilize matters again. When, by the decree of 1848, the threefold nominations of the faculties were "provisionally" made the rule, and in 1849 the office of Director of Studies was abolished, the authorities soon seemed to become doubtful about the value of the new system.

In 1860 (Imperial Resolution of October 20) during the Ministry of Von Schmerling, an "Education Board" was created, consisting of the prominent persons in all the faculties and constituting, in a sense, the professional court of last resort for all educational affairs. This body was not called into being until 1863; its first president was Von Hasner, after whom came Von Haimerl. At that time educational matters were handled by a special department in the Ministry of the Interior, although a union of the Departments of Justice and Education was later effected (under Von Hye, in 1867). When the Ministry of Education once more became independent, under Von Hasner, the "Education Board" was again dissolved (Imperial Resolution of September 14, 1867). It was a cumbersome apparatus of professional men (with 33 members) who were divided into six sections: universities, *Gymnasien*, higher technical schools, secondary and professional schools, art academies, and public schools. The section for universities was further divided into faculty sections, each faculty having seven representatives. The representatives of the medical faculty were Hyrtl, Von Pitha, Von Schroff, Skoda, Balassa, Vanzetti and Waller. This was far too much, and yet far too little. The threefold nominations by the faculty, and reference of these nominations to the senate were established, but when all this was said and done—the Minister could still do as he pleased.

Well-intentioned as all this was, it proved to be as impracticable as Martini's Committee on Curriculum. These institutions were therefore soon dropped.

Then followed the system of expert advisers to the Minister. If we could prevent people from becoming grizzled and mouldy with age, this plan would perhaps be practicable; but since this is not possible, it would be best if the university commissioner were to seek his intermediaries for the faculty negotiations in each case separately. That is what the Prussian Ministry of Education does. There are no professional experts in university matters in the Ministry, and the commissioner must look after university affairs personally, which, after all, is what he is there for. Someone has said that a good impresario must be on the road more frequently than he is on the stage, and the same may be said of the university commissioner. Nothing is more detrimental to his effectiveness than to remain in the same place and to hear the same things said over and over again by the same people. If he does so, he can never free himself from personal influences.

The decisions of the councils of professors at Vienna are of incalculable effect because of the size of the faculties, if for no other reason. Not infrequently the results of the balloting arouse the greatest astonishment in the council itself. Because of the large number of positions, and the correspondingly frequent vacancies, the corporation is far too often roused to fever pitch. The appointment of adjunct professors, which in other places causes no stir, here becomes a complicated party matter, for the adjunct professors become members of the council in order of their seniority. If the faculty votes a man down whom for any reason it does not wish to have in the council, there is a great concerted outcry, with many reverberations in the press. Then follows pressure on the Ministry. One fine morning the council is surprised at the appointment by the Minister of a full or adjunct professor whom it would never have considered on the basis of his standing as a scientist. Then again follows a great chorus of objections, which is echoed in the press. The burden of the protest is that the faculty, in order not to create too many adjunct professorships, and not to make too many demands on the Ministry, has for the time being passed over many able men who have accomplished things and who have a right to advancement; and now the Ministry suddenly chooses someone from among the lecturers whom no one has ever considered!

Occasionally such things happen in all faculties, in republics as well as in constitutional and absolute monarchies, but their consequences are not serious. At Vienna, however, these especially favored men gradually get into the council, and speak and vote by the side of the full professors. It is for this reason that even the apparently innocuous appointment of adjunct professors, either with or against faculty approval, invariably causes the greatest excitement. The faculty is supposed to be responsible for its decisions and recommendations, but it is powerless to prevent the intrusion of elements which with their votes can upset the most carefully considered plans.

The Ministry has made all appointments unusually difficult, first, in that it has created so large a teaching force, which must always act as a body, and secondly, by not imposing strict secrecy on this body in the transaction of its official business.

Since I have had access to only a small part of the faculty statutes of the German universities, many of the latter being without statutes, I can only point out that Paragraph 32 of the Berlin statute reads as follows: "Each member is bound to secrecy concerning all the written and oral business of the faculty, while it is still pending." In the laws of Königsberg and Greifswald the corresponding paragraph reads as follows: "Each member is bound to silence concerning all business pending before the faculty, and also after its completion, if the faculty should so decide."

I shall be told that the council itself may make such a decision and act upon it. Apart from the fact that this would not be so effective as a paragraph of the law, such a resolution would scarcely carry, because even in the faculty there are some who believe that the proceedings of a council of professors are of public interest. Whether official secrecy would be possible at Vienna, with a council of more than 30 members, seems doubtful. It is said that friends in North Germany keep secrets from each other, while friends in South Germany share each other's confidences. In Austria people like to gossip, and in so doing they often say and hear more than they intend. Everybody gets greatly excited over it, and then calms down again just as quickly. There is little chance for secrecy at Vienna.

If a professor has not been at the session he can read all about it in the columns of the "Neue Freie Presse," by how many votes any particular motion was passed, who was nominated for appointments, etc. In the medical weeklies the council, its decisions, its attitude toward the Ministry, and even the Ministry itself are critically illuminated. The university commissioner and the Minister learn from the paper what recommendations the council will lay before them. Some of these notices are copied by the great papers all over Germany, and other governments learn through the press that this or that university intends to call some professor away from them.

I cannot convince myself that this procedure is wise. I do not see how confidential and diplomatic "feelers" and negotiations are possible under such circumstances. Nor can it be agreeable to the prospective appointees to read how vehemently they have been discussed, and by what margin of votes their nominations were approved by the faculty.

I do not know whether the university commissioner leaves the semi-official correspondence concerning an appointment to the dean at Vienna out of courtesy, or convenience, or in order not to bind himself. In any case the practice is not workable.

The loss of some good men and the miscarriage of certain important academic calls are undoubtedly to be ascribed to the clumsiness of this system. The chief reason for these conditions is, of course, the fact that because of the constantly increasing cost of living, and the reduction in the number of students in the large cities, the professors are trying to get away from the big centers into the smaller university cities, where with a moderate salary they can live far better than with the highest salaries in the large cities. Out of this situation one advantage has come to the large universities: frequent changes occur in the faculties and younger teachers are constantly entering the field, so that the faculty does not so easily become the victim of inbreeding—a danger which especially threatens a university faculty in a capital city.

The Training of Teachers.—The governments of the larger states have rightly drawn attention to the necessity of finding ways and means to assure the training of successors for vacant teaching positions. This is not to be condemned as emanating from a stupid and vain desire to appoint only native teachers. On the contrary, the motive is to give ambitious young people an opportunity to train themselves to become capable teachers, and by so doing to raise the level of national culture and to make it increasingly independent. Every German state, so far as its resources will permit, should set itself this goal, not only in order to serve the German nation as a whole, but also particularly to encourage its own natives and to spur them on to competition with the ambitious young men of other countries. But here, too, the governments must not cherish any illusions concerning the goal that may be attained through state organization, teaching methods and academic training.

Talented and diligent young men can be trained to be quite useful teachers, but men of the first order, men of genius, destined to blaze new paths for science, cannot be trained to order. They are born, sometimes a number of them in succession in one country—then they come less frequently, and for a time they seem to cease altogether. Then they appear elsewhere in large numbers, only to disappear there, too, and to reappear in still other parts. Only the greatest of research workers, and particularly the exceptional teachers, become the founders of schools; they in turn attract to themselves men of talent. Not always through personal contact; very often they exert their influence through the force of the new ideas disseminated in their writings. Sometimes that influence is not felt until the second or third generation after their death, after their theories have passed through the hands of some man of mediocre talent who is a good teacher.

A government can develop, through its provisions, a condition of substantial prosperity in matters of science; but whether such favorable conditions shall produce monarchs in the several fields of science, intellectual millionaires, brilliant university teachers, or founders of schools, will depend not so much on the government as on the whims of nature, which creates different varieties without regard to the conditions of the soil. From time to time different branches of science, after they have made conspicuous progress at some university, suddenly come to a standstill, the new impetus having for the moment become exhausted. This situation must not be mistaken for the sterility of the whole tree—there is likely to be another shoot on another bough soon. When has any tree borne the same load of blossoms and fruit in successive years? It should not on that account be despised or its care neglected. If we desire to see it constantly in bloom, we must supply it with grafts in those seasons when it produces nothing of its own accord; or if we fail to do at least so much, we should be satisfied with what it is able to yield by its own efforts.

Vienna.—At Vienna it was especially Martini who encouraged the younger generation in its endeavor to teach. The Court Resolution of November 18, 1790, states: "(a) The candidates who pass the examinations shall be given permission to deliver special lectures in the subjects in which they have done their major work, in order that we may judge from their success in training pupils how likely they are to succeed as future teachers." The records seem to indicate that the only man to take advantage of this permission was Dr. Vietz, who taught public sanitation (1803). Whether the regulation met with greater success in the other faculties, and whether it was encouraged by the Directors of Studies, who soon afterward made their appearance again, I do not know. The procedure in permitting such lectures was bound up with not a little red tape, according to the following instructions to the Assistant Director of Studies: "Anyone wishing to give special lectures must lay before the Assistant Director in charge of the department concerned a detailed syllabus, setting forth the purpose of the lectures, the text-book or manual to be used, the hours, the place, the conditions, and the sort of audience for whom the lectures are intended, all of which the Assistant Director is to forward, with an expression of his own opinion, to the government."

It was, however, soon recognized that in the medical faculty the position of assistant must be the actual training school for young teachers; and therefore in 1811 (Order of the Imperial Commission on Schools, September 20) there was issued "An Order for the Establishment of Training Schools for future Professors of Medicine and related Sciences." This order provides (1) "The aides, assistants, prosectors and student practitioners who are assigned and subordinated to the professors, and the secondary physicians, i.e., the surgeons, assistants and practitioners who are employed in maternity or other hospitals, are to be the students in the training schools for future professors." (3) "In choosing the students of such a training school those shall receive preference who during their undergraduate days most clearly exhibited the talents and qualities that are desirable in a professor."

As if to show its determination to accomplish all that could be done by way of regulation, the government added the following provision: (6) "The directors and professors must see to it that the individuals described in Paragraph 1 attain the highest possible degree of training in the sciences assigned to them; and therefore, (7) they may not be asked to perform any tasks which might prevent the attainment of their chief purpose, or which are not directly in the line of their official duties."

When a chair became vacant the applicants had to pass a competitive examination before the faculty. This consisted of two papers, which were read by the departmental professors, and an examination in the presence of the entire teaching staff. Only in very exceptional cases were appointments to be made without a competitive examination. Later the competitive examination became the exception and direct appointment the rule. The later requirements for admission to the position of private lecturer (Privatdozent) probably grew out of these competitive examinations. These requirements include the submission of printed or manuscript essays, a colloquium before the assembled faculty, and a trial lecture.

Inasmuch as the assistants, prosectors, etc., were finally permitted to give courses and to hear recitations, and later to issue certificates of the completion of courses in operations, which were valid in securing admission to the state examinations, these assistants came to possess *eo ipso* the rights of lecturers. There also gradually appeared a growing contingent of special teachers, who lectured for a fee, but only on the subsidiary subjects. The system of private lecturers, then, existed in fact long before it was officially introduced in the University Law of 1849, in which we read that "private lecturers are not employed by the state, but are merely men to whom the state gives permission to teach. By virtue of this permission they have the right to announce their lectures publicly and to deliver them in the rooms of the university."

In the budget of 1875 the Ministry asks for 40,000 florins for the encouragement and support of young men who wish to enter upon the career of a private lecturer but who lack the means to do so.

Prussia.—The Prussian Ministry has proceeded in like manner, presumably under the influence of Sybel, who has at various times proposed that in order to enable ambitious young people to study for more than three or four years they be given generous scholarships and prizes.

The decree of the Austrian Minister of Education of March 25, 1875, reads as follows:

> "In the fiscal order for the year 1875 a larger amount of money than formerly has been provided for the training of academic teachers, which should make it possible to relieve the prevailing lack of teachers in the several academic fields. To this end I am asking the Senate to give the following information to the professors' councils of the faculties:
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> "(1) The government will foster the training of academic teachers in two ways: by assisting candidates for an academic career, and by paying private lecturers.
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> "(2) Candidates will receive assistance as a rule only after the faculty has been consulted. All requests for such assistance will be referred to the faculty by the Ministry of Education. The faculty may on its own initiative propose candidates for such assistance, or it may refer to the Ministry requests for assistance, with a statement of its recommendations.
>
> "(3) In making the proposals the faculty shall consider only those candidates who excel because of their natural talents, their industry and their zeal for science, and of whom it is to be assumed that without state support they could not undertake a scientific career. All candidates proposed must be of thoroughly reliable and honorable character.
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> "If there are a number of candidates, preference is to be given to those of the greatest ability; and if different fields are involved, the one in which there is the greater need for teachers shall have the preference.
>
> "(4) The most reliable basis for judging the scientific ability of the candidates would seem to be their work in the seminars and laboratories, everywhere, in fact, where closer contact may enable the teacher to get better acquainted with the personality of the candidate. The certificates obtained in the state examinations and the *Rigorosa,* conferences and published works furnish other criteria.
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> "(5) The further advanced the candidate is, the greater the certainty with which his fitness for the academic profession can be judged. For that reason candidates who already have the Doctor's degree have the preference. This does not, however, exclude the possibility that especially distinguished and dependable men, even in the earlier stages of their education, and indeed even while they are still at the university, may be recommended for state assistance.
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> "(6) State support will be given either for travel for the purpose of attending foreign universities, or for the undisturbed completion of an academic course at home, for the prolongation of studies at a university, etc.
>
> "(7) When assistance is granted the conditions under which it is allowed will be stated. One condition demanded of all candidates is that after

the completion of their studies they settle down at one of the universities of their own state, and remain there for six years as teachers.

"The candidates further obligate themselves, in case it should become necessary to strengthen the teaching staff in their subject at any university within the state, to teach at such university for a suitable salary.

"(8) The payment of private lecturers can be requested by the faculty when a lectureship is required for the rounding out of a subject, or when it is a question of keeping scholars of merit in the teaching profession. But the faculties must keep in mind that our academic system contemplates only the unsalaried lectureship, and that therefore the payment of a salary to lecturers must in the future continue to be regarded as exceptional."

Scholarships.—The order of the Prussian Minister of Education of April 24, 1875, reads as follows:

"In this year's budget a fund of 54,000 marks has been placed at my disposal, as stipends for private lecturers and other younger scholars who are presumably fitted for a university career. The second provision stated as the purpose of the fund gives me, in greater measure than before, the welcome opportunity to make it easier for men of talent, but without financial resources, to prepare themselves for an academic career. A necessary prerequisite for every case where such assistance will be granted is the completion of the university course, and the attainment of the doctor's degree with honors. But in addition I shall have to demand proof that the pre-eminent ability and capacity of the petitioner justify his desire to devote himself to an academic career and warrant his hopes for future noteworthy accomplishment. Above all I shall in this connection lay emphasis on the scientific work already accomplished by the applicant. While in disposing of this portion of the fund I must reserve the right to obtain at my own discretion the necessary assurance in each individual case concerning the circumstances, and the advisability of granting the requested stipend, I wish also to state here that in distributing the stipends to lecturers already established, I should like in every instance to have the co-operation of the faculties to which they belong. I find myself therefore compelled to put before the faculties, as a guide for possible applications which perhaps they may put before me of their own accord, and in preparing the reports which they are to furnish me at my request, the principles by which they are to be governed. In establishing the fund it was not intended to provide salaries for private lecturers in the form of scholarships. It is rather the purpose of the fund merely to protect the university against the loss of good teachers, who give up their careers under the pressure of want, or who are hindered in their development and therefore lost to science.

"The first condition, then, for the granting of a stipend to a private lecturer is proof that his financial position is such that his continuance in the academic career until he receives a regular appointment becomes impossible, or is rendered so difficult because of the necessity of his earning money on the side, that his development as a scientist is endangered. Private lecturers, therefore, who draw pay as assistants, cannot as a rule be considered. Poverty alone, however, is in no case an adequate recommendation for such stipends. If admission to a lectureship itself is granted only to those who may safely be expected to succeed in earning a professorship through their achievements as writers and teachers, this standard will have to be applied with redoubled severity when we encourage a lecturer to continue in the career he has begun, by giving him state funds. We must therefore refuse to grant a stipend in all cases in which an unbiased investigation of the personality and the achievements of a lecturer indicates that he had better abandon the profession, in which his continuance would only bring disappointment both to himself and to the university.

"The faculties may recommend such assistance only when they are convinced that it is the interests of science, and that the support given does not merely afford the lecturer concerned temporary relief, but will achieve a substantial advantage. Private lecturers who have been in residence for a long time without having gained recognition in their field are to be excluded in any case. Great weight is to be given to evidence of unusual teaching ability and it will therefore always be expected of applicants that they shall have delivered lectures with some success. No stipend will be given a lecturer immediately after he is installed, unless his attainments leading to his installation justify the expectation of great distinction. All publications of a candidate are to be taken into consideration, and their value and importance noted in the recommendations and reports in his behalf, with which such publications shall be submitted.

"The individual scholarships, the highest of which is set at 1500 marks a year, shall be given as a rule only for one or two years. An extension is permissible, but no one may hold a scholarship for more than four years in all. An extension will be granted only if repeated examination indicates that the assumptions under which the first grant was made have not proved to be erroneous."

It is not for me to judge how such measures would succeed in other faculties, but I am convinced that a sincere desire to do the right thing underlies both orders. Such measures could be successful in the medical faculty only if the money were used to create more positions for assistants in the laboratories of the faculty; for, with few exceptions, only assistants will be able to undertake the career of a professor with any chance of success. All teaching posts in the medical faculty have become so largely demonstrational that it is hardly possible for the lecturers to play an independent rôle if they do not obtain permission to teach in a laboratory, or if they are not themselves in charge of a ward in the large hospitals.

This now seems so self-evident to us that we can hardly understand how it could ever have been otherwise; yet history teaches that the way to a professorship was formerly quite different. Only since the third and fourth decades of this century did the teaching laboratories of the medical faculty become so extensive and permanent that assistantships in the modern sense began to be necessary. Then, too, the jealousy of many scholars toward the younger men used to be so great that they had no desire at all to train pupils. Even today we find remnants of this attitude.

The normal course of a scholastic career, therefore, was formerly dependent on able literary work alone. When the doctors had finished their studies and travels (for without travel a career as a medical professor was formerly inconceivable), they settled down somewhere to practise for a time. If they considered the results of their experience and research important enough to have them printed —which was not so easy under the prevailing conditions in the book publishing business, and in view of the small number of periodicals —it was the success of their work before the forum of the academic world that decided their future fate.

Griesinger more than once said to me in jest, when we were talking of the rapid careers which for a time were common, especially among the young physiologists: "In former days we had to be very learned or highly talented to become a professor; now a man need only look into a microscope a few times or maltreat a few frogs, and overnight he becomes a famous man." Those halcyon days for the young candidate for a professorship are over. There are many lecturers who have looked frequently into a microscope, and who have maltreated many frogs, and who consider themselves very learned and talented—but a cynical world refuses to agree with them, and wicked governments are not always ready to confer professorships upon them.

I am distinctly under the impression that among all the nations the Germans have decidedly the best prospects for able medical recruits in the future; nor do I doubt that if we professors were all to die at once to-day, we should all be replaced immediately, and so ably that the development of German science would not be halted for a moment in its rapid progress.

The Imperial Austrian Ministry of Education and Instruction is not of this opinion, although it is not entirely clear to me upon what grounds its pessimism is based. It is hardly to be assumed that the erstwhile member of the Frankfort Parliament wishes to sever German Austria from the German nation, and to make it dependent solely on its own fertility and its own "creations." That in Austria the standards of scientific production are so much higher than those in art and industry, in trade and business, can be explained only by the fact that Austria has become so accustomed to the brilliant accomplishments of former generations in the field of medicine that it now takes such extraordinary achievements for granted, and fancies that it is only necessary to make suitable provisions and enactments in order to "create" distinguished teachers and scholars as the state may require them.

In the extract from an exposition "of the present academic conditions in Austria, with especial reference to the lack of teachers," which is appended to the annual report of the Imperial Minister of Education and Instruction for 1874, the great number of able and ambitious men at the young medical school at Vienna is recognized, so far as the practical subjects are concerned, but "the professors in the theoretical branches have not always been able to produce enough men to take their places." It would not be suitable for me to venture an appraisal of those pupils of my colleagues who have already established their reputation, as for example the special pupils of Brücke: Professors Albini at Naples, Vintschgau at Innsbruck, Kühne at Heidelberg, Stricker, Schenk and Exner at Vienna. Their importance as investigators and as founders of schools may be variously estimated, but it seems hardly fair, when such men have been produced, to emphasize the unproductiveness of the modern Viennese school in the field of so-called theoretical medicine. The same is true of normal and pathological anatomy. Of course, no one knows whether these pupils of the Viennese school are in every way competent to fill any possible vacancy in the professorial council of the university. If we cherish the hope, as I do, that the medical faculty at Vienna is to remain the foremost in Germany, which is to say the foremost in Europe, when vacancies occur we ought to think only of the most prominent men in the field, in the entire German nation, who are at once young and qualified to fit themselves into Austrian conditions. Let him who thinks in lower terms than these of Vienna and Austria set lower standards.

In complaining, in the exposition quoted above, that men like Oppolzer, Skoda, Hyrtl, Rokitansky, have not yet been replaced, the government is demanding too much of its professors as trainers of teachers; and yet the demand itself should fill us with pride. No matter how much one may personally find to criticize in the men named, they represent the leadership of the highest aristocracy in German science. They grew up into the Viennese school, but they were not "created" by it. This is admitted in the document quoted, in which we read: "On the other hand we must keep in mind that especially high standards must be set for just this faculty, if we wish to preserve the *status quo*."

Physiology has not yet found ways and means of creating equally successful children, all possessing equal talent, just as the most distinguished teachers have thus far been unable to produce men of distinction according to definite plans and patterns. Perhaps in the future the Faculty of Political Science, especially at Budapest, will be reproached because the candidates for government positions turned out in different years vary so much in quality, and because there is no supply of recruits who meet the high requirements.

That the number of coming young men, and therefore the field from which a choice may be made, is greater in the clinical divisions at Vienna than in anatomy and physiology, may be explained, for Prague and Vienna, by the fact that lecturers in practical subjects can establish a medical practice alongside of and partly because of their academic work. This is not possible for the young anatomists and physiologists, because in German lands the custom is against it. In England, Holland, and Italy no differences in this respect are known. Still more important is the fact that in the practical fields there is much less risk of a complete failure in the young doctor's career. Not only are the clinical professorships in Austria far more numerous than those in anatomy and physiology, but the position of lecturer is always a recommendation for the many openings as directing physicians in the numerous large and small hospitals. If not all can become professors in a clinic, many do achieve a good position as head of a ward. This in itself is a great success for an ambitious physician. But what is to become of all the candidates for professorships in anatomy, physiology and pathological anatomy that are produced every three or four years, and for whom there are in German Austria precisely three places? What is to be done with them?

In the German Empire there has been in these fields such an overproduction for several years that even emigration to Italy, Holland, England, and Russia has not been able to relieve the pressure of crushing competition.

Only by founding more professorships in the so-called theoretical subjects, and by establishing more medical faculties generally, can a larger number of recruits in these fields become useful. The recruits must have room in which to develop; only then will their numbers, and our opportunities to choose among them, increase. Paradoxical as it may seem at first glance that the lack of teachers must be relieved by the establishment of more universities, it is nevertheless correct, and the situation is rightly understood by the Austrian Ministry of Education.

The best motto for the private lecturer to keep in mind is the sentence by Plater, quoted by Jacob Grimm: "Then I took my seat in a corner not far from the schoolmaster's chair, and I said in my heart: in this corner you are going to learn, or die."

Distinctive Medical Schools.—Although I have explained above that our highest aims in making rules for the establishment of training schools for professors, and in giving scholarships, prizes for scientific work, etc., can never, in the nature of things, be fully realized, I am far from undervaluing these efforts. Much thought about this important matter has led me to some observations on the development of various types of German medical schools, and I should like to record a few of them in passing, since they may not be without some cultural interest. In so doing I shall endeavor to reinforce in a general way the proposition stated above, namely, that state institutions as such do not constitute or create schools of science, but that these always develop from and around individual personalities of great distinction. It follows that governments can reach the goal at which they aim—the formation of distinctive schools—only if they seek above all else to attract the most important men of their times.

We can speak of a purely German school only where German-trained teachers are training German pupils. The first German teachers who, at the end of the last century and the beginning of this, worked successfully with German students, brought their knowledge (as did the German painters) chiefly from Holland, but also from England and especially from France. Italy's day of glory was already over, and her art and science had in the main migrated to Holland (Leyden).

I do not wish to detract from the reputation of the German masters of our art, particularly not from the fame of the excellent German surgeons of the period under discussion, but there was in the second and third decades of our century no steady development of scientific medicine of an independent national character, taught in the German language exclusively. In the following pages I shall give the lines of descent as between teachers and students, so far as I have been able to trace them. I hope that no essential errors have crept into my sketch, and I am bound to say that I could not have made it without disregarding the fact that many of my esteemed colleagues may not like to be considered the pupils of any other person.

ANATOMY

Bernhard Siegfried Albinus (whose real name was Weiss and who was born at Frankfort a.O., 1697-1770), Ruysch (1638-1731) and Boerhaave (1668-1738), who were in Leyden together, mark the zenith of the Dutch medical school. There **Albrecht Haller** of Bern (1708-1777), who must be called the father of German anatomy and physiology, was educated. In comparison with him another pupil of Albini, Nathaniel Lieberkühn (Berlin, 1711-1756), however important he was as a pure anatomist, seems very insignificant. But who could have claimed greatness alongside of Haller?

Carl Caspar Siebold (1736-1807), born in the Duchy of Jülich, belongs to those who brought from Leyden to Germany the clinical method of studying and teaching medical science. Chiefly with the assistance of his sons and grandsons he founded an important school in Würzburg. In addition to those named above, Haller's teachers were Duvernoy (Tübingen), Douglas (London), LeDrau and Winslow (Paris), and Joh. Bernoulli (Basel). Haller taught at Basel, then devoted himself to his studies at Bern, and in 1736 accepted a call to Göttingen, which was then being founded, and worked there until 1753, when he withdrew to private life in his native city of Bern. The immediate pupils of Haller who founded schools are Joh. Friedrich Meckel (1713-1774), at Halle, and Heinrich August Wrisberg (1739-1808) at Göttingen. Joh. Gottfried Zinn (1727-1759, Göttingen) also belongs to the most distinguished of Haller's pupils, but his life was too short to permit the founding of a school.

J. F. Meckel's school at Halle descended to his son Philipp Friedrich Theodor (1756-1803) and his grandson Joh. Friedrich (1781-1833), whose brother Albrecht (1789-1824) was professor of anatomy at Bern. A son of the last-named was Heinrich Meckel, called Von Hemsbach (1821-1856), who as a pathological anatomist was a pupil of Rokitansky, the predecessor of Virchow at Berlin. His nephew is Eduard Rindfleisch, professor of pathological anatomy at Zurich, Bonn and Würzburg, a pupil of Virchow and Heidenhain. This is a splendid genealogy, unmatched in length even when compared with the Hunters, the Bells, and the Monros in England, the Larreys in France, and the Webers, Textors, Siebolds, Graefes, Langenbecks, Stromeyers, Chelius, Démmes, Jaegers, Arnolds, Volkmanns and Schultzes in Germany and Switzerland.

The most famous pupils of **Wrisberg** are Christian von Loder (1753-1832; born at Riga, and professor at Jena, Halle and Moscow), **Samuel Thomas Sömmering** (1755-1830; born at Thorn, professor at Cassel, Mayence, Frankfort a. M. and Munich), and Joh. Friedrich Blumenbach (1752-1840, Göttingen).

These men were the first to bring comparative anatomy, anthropology and embryology within the domain of anatomy and physiology. There now arose a South German school of anatomists and physiologists, whose chief activity lay in the direction of morphology, as I have just intimated. The chief founders of this school were Lorenz Oken (1779-1851, Freiburg, Jena, Munich, Zurich), **Ignatz Döllinger** (1770-1841, Bamberg, Würzburg, Munich), and Carl Friedrich Kielmeyer (1765-1844, Stuttgart, Tübingen, and teacher of Cuvier). Döllinger was a product of the school of Caspar von Siebold (Würzburg), Barth (Vienna), and Ant. Scarpa (Pavia), and also influenced by Sömmering. Döllinger's predecessor in embryology was Caspar Friedrich Wolff (1735-1794) who was probably a pupil of the elder Meckel, and who later taught at St. Petersburg.

Out of this school come Friedrich Tiedemann (Hiedelberg, deceased at Frankfort), Carl Friedrich Heusinger (a pupil of Oken at Jena, afterwards at Würzburg and Marburg), Christian Pander (Würzburg), K. E. von Baer (Königsberg, St. Petersburg), Agassiz (Paris), Rathke (Königsberg), Rudolf Wagner (Erlangen, Göttingen), Ecker (Freiburg), Bischof (Giessen, Munich, who has a pupil Rüdinger, at Munich), Troschel (Bonn), Stannius (Rostock), Theodor von Siebold (Freiburg, Königsberg, Breslau, Munich), Carl Vogt (Giessen, Bern), Schultze (the elder; Freiburg, Greifswald). The influence of Döllinger was very marked upon Johannes Müller (1801-1850, Bonn, Berlin), although indirectly, and the majority of his students have gone in this direction.

J. Müller was, however, far more deeply influenced by **Carl Asmund Rudolfi** (1771-1832, Greifswald, Berlin), of whom he says: "I have enjoyed his instruction, his advice, his fatherly friendship for a year and a half; he in part inspired my love for anatomy, and settled my steadfast affection upon it for all time."

Among the teachers of Rudolfi there are no famous names, with the possible exception of Hufeland, whose lectures he heard at Jena. Above all others he admired Haller and, like him, took botany as his point of departure; but his development must be regarded as altogether independent.

Johannes Müller is thus a product of both of the South German and of the Northern tradition. Both schools, to be sure, originate directly or indirectly with Haller, Albin or Boerhaave. J. Müller became the founder of the Berlin school of anatomists and physiologists, of which group I shall name, for the moment, only those whose work tended chiefly in the direction of morphology. These are Theodore Schwann (Berlin, Liége), Valentin (Bern), Miescher (Basel), Henle (Zurich, Heidelberg, Göttingen), Reichert (Breslau, Berlin), Gerlach (Erlangen), Kölliker (likewise a pupil of Henle; Zurich, Würzburg), August Müller (Berlin, Königsberg), Remak (Berlin), La Valette (Bonn), His (a pupil of both Kölliker and Virchow; Basel, Leipzig), Haeckel (Jena), Kupffer (Dorpat, Kiel).

Among the pupils of **Tiedemann** the following are worth noting: Arnold (the elder; Freiburg, Tübingen, Heidelberg), and the pupils of Arnold: Luschka (d. 1875, Tübingen), Kobert (d. Freiburg), J. Arnold (the younger; Heidelberg).

Rudolf Wagner founded a large school at Göttingen. Among his pupils are Vogel (Göttingen, Giessen, Halle), H. Frey (Göttingen, Zurich), Bergmann (Göttingen, Rostock), Leuckart (Göttingen, Giessen, Leipzig), Th. Frerichs (Göttingen, Kiel, Breslau, Berlin), G. Meisner (Basel, Freiburg, Göttingen; a pupil of both J. Müller and Von Siebold), Billroth, W. Krause (Göttingen).

The pupils of **Reichert** are Lieberkühn (Marburg), Waldeyer (Strassburg).

The pupils of **Kölliker** include Heinrich Müller (d. Würzburg), Leydig (Würzburg, Tübingen, Bonn), Gegenbauer (Würzburg, Jena, Heidelberg), Eberth (Zurich), Carl Semper (Würzburg).

Max Schultze (Greifswald, Halle and Bonn) was the pupil of his father. His pupils were Schweiger-Seidel (Halle, d. Leipzig) and Schwalbe (Jena).

The pupils of **Henle** included Kölliker, and Henke (Marburg, Rostock, Prague, Tübingen), who was also a pupil of Bunger at Marburg. Bunger was the teacher of L. Fick (Marburg, 1812-1858).

The Prague and Vienna school of anatomists and physiologists also dates from Albin at Leyden. It constitutes an unbroken succession which I shall set forth in the following paragraphs according to the data supplied me through the kindness of my esteemed colleague, Professor Langer.

Prague.—The first man who can be called a teacher of anatomy and physiology at Prague (1745-1778) is Fr. Joseph du Toy, a native of Prague. He studied at Leyden under Albin, and was succeeded by his pupil Klinkosch.

In 1776 advanced anatomy and physiology were separated from descriptive anatomy, and Prohaska, a Bohemian who had studied at Vienna under Barth, and had been assistant to de Haën, a follower of Boerhaave, returned to Prague and took over the professorship of physiology, while anatomy was taught only by a prosector.

One of the later prosectors, Ilg, became full professor of anatomy in 1809, but the prosector's position remained, and since that time separate full professorships for anatomy and for physiology have continued to exist at Prague. Ilg, before becoming a professor, had been prosector at the Joseph Academy (Josephinum) at Vienna. He was a pupil of Adam Schmidt (anatomist at the Joseph Academy) and of Barth (anatomist at the university). He was highly skilled in the technic of injections, as were most of the pupils of Barth, and did beautiful work in the anatomy of the ear.

Another prosector under Ilg, at Prague, was Purkinje. He dared to attend one of the then forbidden German congresses of natural scientists, where he became acquainted with Rudolphi, whose daughter he subsequently married. He then accepted a call to Breslau, and after a few years, when Prohaska was transferred to Vienna, he returned to Prague and to the Czech nationalistic movement. The contact between the Prague school of physiologists and the northern school at Breslau is interesting. **Purkinje** is the most important physiologist Austria has thus far produced, and his work is held in high esteem by all modern physiologists. Joh. Czermak, the physiologist who died recently (1873), was his pupil. Purkinje's place at Prague is now occupied by Hering.

Another pupil of **Ilg** is Bochdalek, who was called to the chair of pathological anatomy which had in the meantime been established, while Hyrtl, who until his appointment was a prosector under Berres at Vienna, became Ilg's successor as professor of anatomy at Prague. When Hyrtl was later promoted to Vienna, Bochdalek became professor of anatomy, while the chair of pathological anatomy was filled by Engel (a pupil of Rokitansky, who was recalled from Zurich). When Engel was called to the Joseph Academy at Vienna, the place was given to Treitz, a pupil of Bochdalek and Engel. Treitz's successor is Klebs; Bochdalek was succeeded by Henke, who is now at Tübingen.

Vienna.—Although Gerhard van Swieten's protégé, **Laurentius Gasser,** did excellent work in anatomy at Vienna (1757), the teaching of the subject did not take definite form until the days of Ferdinand Leber, 1761. Leber, who was also professor of surgery, taught in the tradition of Winslow (1669-1760, a native of Denmark and professor of anatomy at Paris), and of Haller. Although neither Gasser nor Leber had ever been in Leyden, they had acquired a fairly adequate understanding of what anatomy could accomplish, from the preparations of Ruysch, Albin and Lieberkühn, which Van Swieten had bought for the anatomical museum at Vienna, and which were still on hand. The effect of these preparations, and the desire to imitate and surpass them, was especially evident in Barth, the successor of Leber, who was later sent travelling by Van Swieten, with the especial purpose, however, of studying ophthalmology. Barth's origins are hidden in obscurity. He was born in Malta, had studied at Rome, and probably brought his technic of injections with him from Italy. (Only recently I saw in the anatomical museum at Rome some wonderfully well-preserved injection and nerve preparations dating from the end of the last century.) Among his pupils are Prohaska (who has already been mentioned in the discussion of Prague), Beer (the founder of the Austrian school of oculists), Hunczowsky (later professor of surgery at the Joseph Academy), and Vetter, one of the predecessors of Rokitansky. Conrad Martin Langenbeck (1776-1851) must also be considered a pupil of Leber, Barth and A. Schmidt, since in 1798 and again in 1802 he spent many months at Vienna.

In 1791 Prohaska was called from Prague to Vienna to teach anatomy and physiology. In 1800 he gave up the chair of anatomy to the prosector Michael Mayer, who later became full professor of anatomy. Thus the separation of the professorships of anatomy and physiology at Vienna was brought about by Prohaska, just as had been the case before at Prague.

After Prohaska the chair of physiology was occupied by Lenhossek, Czermak (the uncle of the above-mentioned physiologist Joh. Czermak) and Brücke. Mayer was succeeded in the chair of anatomy by Berres, originally a surgeon, and probably a pupil of Prohaska. He came to Vienna from Lemberg, where he already had held the chair of anatomy. His pupils are: Hyrtl (Prague, Vienna), Langer (Pest, Vienna), Voigt (Cracow, Vienna), C. Nagel (Lemberg), Dantscher (Innsbruck).

Among the pupils of **Hyrtl** were Langer and Voigt, who were for some time prosectors under Hyrtl; Gruber (St. Petersburg); Rektorzik (Lemberg); Kornitzer, Pokorny (the military surgeon), Friedlowsky (Vienna). Toldt (Vienna) is a pupil of Langer and Hering; Planer (Gratz) a pupil of Rokitansky.

It is evident that the Austrian school of anatomists and physiologists, among whom there were men of great distinction in their field (every medical man knows the *ganglion Gasseri, Ehrenritteri, Bochdalekii,* the *venous figures of Purkinje,* and *Purkinje's nucleus,* while Hyrtl's text-book in anatomy is probably one of the best known that has ever been printed), remained on the whole somewhat isolated from the rest of the world, but it had its roots chiefly in Holland and to some small degree, through the teachings of Barth, in Italy.

PHYSIOLOGY

HALLER was an anatomist, physiologist, botanist, surgeon, poet, and statesman. In versatility he is equalled only by ARISTOTLE, GOETHE and ALEXANDER VON HUMBOLDT. In the school which he founded anatomy and physiology were taught together for a time. I have pointed out how the South German anatomists and physiomorphologists were developed out of this school.

Modern physiology has its origin partly in the so-called Theory of Irritability, advanced by HALLER, and partly in the modern physiology of the senses.

The influence of HARVEY, HERBERT MAYO, CHARLES BELL and GALVANI, and later of BICHAT and MAGENDIE on the development of physiology in Germany is unmistakable.

If we may speak of a teacher of JOHANNES MÜLLER in physiology, we can name only **Philip von Walther**, professor of physiology and surgery at Landshut, Bonn and Munich. JOHANNES MÜLLER'S own physiological work was based on the physiology of the senses. The work of his pupils BRÜCKE (Berlin, Königsberg, Vienna), DUBOIS RAYMOND (Berlin), HELMHOLTZ (Königsberg, Heidelberg, Berlin) lies chiefly in the direction of pure physiology. BRÜCKE alone has done important work in histology. In part preceding, and partly contemporaneous with the scientific pre-eminence of these men, is the work of BURDACH (a product of the Leipzig and Vienna schools; Leipzig, Dorpat and Königsberg, 1776-1846), ERNST HEINRICH WEBER (Leipzig, probably not influenced by his university teacher ROSENMÜLLER), LUDWIG (Marburg, Zurich, Vienna and Leipzig), VOLKMANN (Dorpat, Halle), and VIERORDT (Tübingen). The latter group became the real founders of the now prevailing German national—we may as well say international—school of physiology.

In view of the increasingly rapid intercourse, and of the wider and more rapid distribution of publications, it is now becoming more and more difficult to distinguish important founders of schools in the field of physiology. Most of the present-day physiologists have worked with several university teachers. After the scientific method of research had been firmly established in all fields of medicine, especially through the efforts of ALBRECHT HALLER and JOHANNES MÜLLER, individual development became more and more independent. The compilation that follows presents, in the main, the further relations of teacher and pupil so far as I have been able to discover them.

Von Wittich (Königsberg) is an immediate pupil of Burdach, and Joh. Czermak (d. 1873, Prague, Pest, Jena, Leipzig), of Purkinje and Kölliker. The pupils of **Brücke** include Albini (Naples), Vlakovic (Padua), Kühne (Heidelberg; also a pupil of Wöhler and Dubois), Lenhossek (Pest), Jendrassik (Pest), Vintschgau (Prague, Innsbruck), Rollet (Gratz), Stricker, Schenk and Exner (Vienna).

From the school of **Ludwig** have come Hermann Mayer (Zurich), Adolf Fick (Zurich, Würzburg), Hering (Leipzig, Vienna, Prague), Zion (St. Petersburg). Siegmund Mayer (Prague) is a pupil of Hering.

The pupils of **Dubois-Raymond** are Betzold (Jena, d. Würzburg), Heidenhain (Breslau), Pflüger (Bonn), Bernstein (Berlin), Hermann (Zurich), Rosenthal (Erlangen), Landois (Greifswald).

Funke (Freiburg) is a pupil of E. H. Weber. Eckhard (Giessen), Voit (Munich) and Ranke (Munich) are pupils of Bischof and Liebig (Giessen and Munich). Hensen (Kiel) was probably originally a pupil of Panum (Kiel, Copenhagen), although his later development indicates a very marked independence.

The tendencies of the French experimental physiology (Magendie and Bernard) also struck root in Germany, although because of the opposing influence of Johannes Müller, who was prejudiced against them, they did not spread very far. Among the men who did work in this direction I can name the two Nasses (the elder, a clinical professor at Bonn, and the younger, a physiologist at Marburg), Schiff (Frankfort, Bern, Florence), Traube (Berlin), Moleschott (Heidelberg, Zurich, Turin) and Golz (Königsberg, Halle, Strassburg).

PATHOLOGICAL ANATOMY

Ever since dissections of the human body have been made, there has been side by side with normal anatomy a science of pathological anatomy. This science developed out of a casuistical collation of extraordinary cases, and the descriptions of embryological monstrosities.

Not until later were these disease products correlated with the symptoms of disease, although finally the tendency to do so became so exaggerated that these pathological changes were regarded as identical with the disease process itself. It remained for recent clinical medicine and surgery to reduce pathological anatomy to its proper, and still very great, significance for the understanding of symptomatology and the interpretation of disease processes as such, just as clinical practice and surgery have restored etiology and the concepts of disease entities to their rightful place.

The first systematic book on pathological anatomy was written by the Englishman Matthew Baillie in 1793, and was translated by Sömmering. In French the first work was published by Cruveilhier in 1812, while F. G. Voigtel (Eisleben) produced the first German book on this subject in 1804. This was followed in 1812 by the treatise of Joh. F. Meckel (Halle) and in 1814 by the book of A. W. Otto (Breslau). This series and tradition culminated in the treatise by C. Rokitansky (Vienna) 1846. It had an enormous success and for a long time dominated not only the field of pathological anatomy, but the whole of German medicine. Pathological anatomy was considered identical with clinical medicine, and pathological prosectors and pathological physiologists often passed directly from the dissecting room into the clinical wards. Such men were Dittrich (a pupil of Bochdalek, and probably Oppolzer, who went from Prague to Erlangen; Vogel, from Göttingen to Halle; Hasse, from Leipzig to Zurich; Lebert, from Paris to Zurich; Frerichs, from Göttingen to Kiel; Meynert (Vienna), who as an anatomist is of the school of Rokitansky, but who as histologist, physiologist and psychiatrist, is self-taught.

Rokitansky's personal students have, with the exception of Engel, who was for a short time professor of anatomy at Zurich, remained in Austria. They are Kolletschka (d. Vienna), Dlauhy (Vienna), Engel (Vienna, Zurich, Prague, Vienna), Heschl (Gratz, Vienna), Klob (Innsbruck, Vienna), Schott (Innsbruck), Scheuthauer (Prague), Biesiadecki (Cracow), and Kundrad (Vienna). Besides those named, Wedl (Vienna) must be mentioned as having achieved an absolutely independent development.

At Prague **Bochdalek** was the first professor of pathological anatomy. His pupils are Dittrich (Erlangen), Treitz (Prague). Treitz's successor is Klebs (Berlin, Bern, Würzburg, Prague).

While Rokitansky and his school brought their tradition to a close, three excellent men, Reinhard, Virchow and Heinrich Meckel von Hemsbach, were being developed at Berlin under the influence of Joh. Müller, Froriep (a pupil of Philipp von Walther at Bonn) and Schönlein. Of these **R. Virchow** not only far surpassed his two colleagues, but has also long survived them. He is the founder of the modern German school of pathological anatomy which, by reason of its physiological basis, in combination with pathological histology and chemistry, experimental pathology and the clinic, is beginning to rise to the status of a science of the diseased organism—to the rank of "general pathology." Virchow did not merely train pupils, he founded a school out of which came men who in turn are training pupils. I can name Förster (Jena, Göttingen, d. Würzburg), Beckman (Göttingen), Grohe (Greifswald), Rindfleisch (Breslau, Zurich, Bonn, Würzburg), Klebs (Bern, Würzburg, Prague), Von Recklinghausen (Königsberg, Würzburg, Strassburg), Cohnheim (Kiel, Breslau), Beer (Tübingen, Frankfort), E. Wegner (Berlin), Langhans (Bern), Ponfick (Rostock; a pupil also of Von Recklinghausen).

The pupils of **Von Recklinghausen** are Köster (Giessen, Bonn; he is also a pupil of Klebs), Neumann (Königsberg), Langhans (Bern), Perls (Giessen).

J. Arnold (Heidelberg) is probably in the main the product of his father's school, although he was influenced by O. Weber. Eberth (Zurich) is a pupil of Kölliker and Virchow. I know nothing of importance about the development of R. Mayer at Freiburg, of Müller at Jena (except that he studied for a time under Brücke), of Buhl at Munich, of Beneke at Marburg, of E. Wagner at Leipzig (Schüppel at Tübingen is his pupil), of Zenker at Erlangen, of Fr. Ackermann at Halle. The spirit of Rokitansky and of Virchow dominates all those named, and not only they, but nearly all of our living and many of the deceased medical, surgical, obstetrical and ophthalmological clinicians belong to their school.

It is a school without dogmas, without conceivable limits, in constant flux, and yet because of its methods of research it possesses a unity of purpose such as has never been seen before. Let us hope that this scientific method of research, which in Germany began in the field of anatomy, physiology, pathological anatomy and medicine with Albrecht Haller, will continue to flourish and bear fruit in our country for many centuries to come. The Swiss, A. Haller;

the Badensian, L. OKEN; the Austrians, PURKINJE and ROKITANSKY; the Frank, J. DÖLLINGER; the Rhinelander, J. MÜLLER; the North Germans, TH. SÖMMERING and R. VIRCHOW, together represent a splendid chapter in German science and German civilization.

INTERNAL MEDICINE

We shall find the point of departure for German medicine, as for anatomy and physiology, at Leyden, with BOERHAAVE (1668-1738), who in turn had received his first stimulus from SYDENHAM (1624-1689).

BOERHAAVE had exercised a tremendous influence on HALLER, whose Theory of Irritability was at that time making itself felt in pathology, and which, carried over into England, gave rise to Brownianism (JOHN BROWN, 1735-1788), which in its turn had a great effect on the Germans and must therefore be mentioned here. Through VAN SWIETEN, BOERHAAVE's theory, a form of Hippocratism combined with modern anatomy and physiology (the iatromechanic theory without a dogmatized system) was adopted at Vienna, and there maintained itself in its purest form until very recently. In Central and North Germany for almost a century most of the clinical physicians affiliated themselves with one or another of the systems that were being formulated, until at last within the last three decades all leaders united in the modern scientific treatment of medical science, in which all schools have found common ground. For a better purview of this process I have made the following parallel tabulation, without in any way desiring to suggest any relation or comparison between the men who are listed in succession or parallel. For the various systems I am using the designations employed by HAESER.

The arrangement of this table is not based on the personal relation between pupil and teacher, but on chronological order and local tradition. The excellent works on the history of medicine that already exist make it unnecessary for me to outline the inter-relations of these men. However high a degree of independence the two last named parallel schools have attained, they would scarcely have developed so rapidly without the great influence of France, and to a lesser degree of England, nor yet without the influence of IMMANUEL KANT, who gave the German mind an insight into itself through his auto-physiology of reason, and whose rich imagination embraced even the natural sciences with warmth. BROUSSAIS (1772-1838), Corvisart (1775-1821), Bayle (1774-1816), John Hunter (1728-1793), Cruveilhier (d. 1873), Laënnec (1781-1826), Matthew Baillie (1767-1823), and Astley Cooper (1768-1841) prepared the way for the new German schools.

Boerhaave

Combination of Hippocratism with the Iatromechanic Theory. Contemporaries: Friedrich Hoffman (1660-1742, the Mechano-dynamic System); George Ernst Stahl (1660-1734, Animism).

Albrecht Haller (1708-1777; Theory of Irritability).		Gerhardt van Swieten (1700-1772; Leyden; Vienna).
Joh. Chr. Reil (1759-1836; Halle, Berlin).		Anton de Haën (1704-1776; Leyden, Vienna).
Hufeland (1762-1836; Berlin; The Vitalists, opposed to Brownianism).	Samuel Hahnemann (1755-1843; Magdeburg, Leipzig, Cöthen, Paris).	Maximilian Stoll (1742-1785; Vienna).
J. A. Röschlaub (1768-1835; Bamberg, Landshut, Munich). Transition of Brownianism to the nature-philosophical school, out of which the nature-historical school developed.	Anton Mesmer (1794-1815; Vienna, Paris). Franz Joseph Gall (1758-1828; Vienna, Paris).	Joh. Peter Frank (1745-1821; Speyer, Bruchsal, Göttingen, Pavia, Vienna, Vilna, St. Petersburg, Vienna).
Lucas Schönlein at Würzburg (1793-1864).		

THE NEW BERLIN SCHOOL	THE NEW SCHOOL OF PRAGUE AND VIENNA
Johann Müller (1801-1851), L. Schönlein (1793-1864), Romberg, Virchow.	Purkinje (d.), Skoda, Oppolzer (d. 1872), Rokitansky.

Shortly before, and parallel with the two great German schools noted above, several men developed themselves by their independent efforts, chiefly under French influence. Among these were Peter Krukenberg (d. Halle, a pupil of Himly at Göttingen), Romberg (Berlin, of the school of Hufeland, Horn and Heim), Wunderlich (Tübingen, Leipzig), W. Griesinger (1817-1867, as a clinical teacher much inclined to follow Schönlein), Bartels (Kiel), Seitz (Giessen), Frerichs (of the Göttingen school, later at Kiel, Breslau, Berlin), Hasse (Leipzig, Zurich, Heidelberg, Göttingen).

Krukenberg founded an extensive school, to which belong GÖTZE (d. Kiel), NIEMAYER (Magdeburg, Greifswald, Tübingen), VON BAERENSPRUNG (1822-1864, Berlin), and TH. WEBER (Halle). Among **Romberg's** pupils must be counted HENOCH (Berlin) and MORITZ MEYER (Berlin). THIERFELDER (Rostock) is **Wunderlich's** pupil. GERHARD (Jena, Würzburg) and LEUBE (Erlangen) are **Griesinger's** pupils. JÜRGENS (Tübingen) is a pupil of **Bartels.** MANHARD (Marburg), NAUNYN (Dorpat, Königsberg) and QUINKE (Bern) are pupils of **Frerichs.** Among **Niemayer's** pupils are H. ZIEMSSEN (Greifswald, Erlangen, d. Munich), LIEBERMEISTER (Tübingen, Basel), IMMERMANN (Basel).

Schönlein and his school at Würzburg, Zurich, and Berlin: SCHÖNLEIN'S teachers at Landshut were RÖSCHLAUB, TIEDEMANN, PHILIPP VON WALTER; at Würzburg, DÖLLINGER, the elder MARCUS (1753-1816, Bamberg, Würzburg). The works of AUTHENRIETH (1772-1835, Tübingen), of REIL and of JOH. PETER FRANK strongly influenced him. Greatly affected by the national-philosophical trend, he early freed himself from its influence and in his doctor's dissertation expresses his conviction in the following words: "After a time of storm and stress, the conviction is at last beginning to prevail on all sides that empirical knowledge alone possesses truth and validity."

Schönlein's immediate pupils were CARL F. MARCUS (1802-1856, Würzburg), C. HEINRICH FUCHS (d. Göttingen), VOGT (d. Bern), CARL PFEUFER (Zurich, Munich), BERNHARD MOHR (d. 1849, Würzburg), SIEBERT (d. Jena), EISEMANN (d.), CANNSTAT (d. Erlangen), HERMANN LEBERT (Berlin, Paris, Zurich, Breslau), GÜTERBOCK (Berlin), TRAUBE (Berlin).

The pupils of **C. F. Marcus** were BIERMER (Bern, Zurich, Breslau), FRIEDREICH (Heidelberg). The pupils of **Pfeufer** include LINDWURM (Munich). KUSSMAUL (Erlangen, Freiburg) was assistant to PFEUFER, but was more influenced by KRUKENBERG'S trend. O. WYSS (Zurich) was a pupil of **Lebert.** JOSEPH MEYER (Berlin), PHILIPP MUNK (d. Bern), LEYDEN (Königsberg, Strassburg) and NOTHNAGEL (Freiburg) were pupils of **Traube.** HUGUENIN (Zurich, as a psychiatrist also a student of MEYNERT) was a pupil of **Biermer.**

The School of **Krombholtz** (a pupil of J. P. FRANK) at Prague: OPPOLZER (Prague, Leipzig, Vienna, d. 1872), HALLA (Prague), JAKSCH (Prague). Among **Oppolzer's** pupils are DUCHEK (HAM-

MERNJK's assistant at Prague, Heidelberg, Vienna), SEEGEN (Vienna), BAMBERGER (Vienna, Würzburg, Vienna), SCHNITZLER, ROLLET, STOFFELA, BETTELHEIM, BREUER (Vienna).

Skoda and his school: SPATZENEGGER (Salzburg), KOLISKO (Vienna), HEBRA (Vienna), BENEDICT SCHULZ (Vienna), LÖBL (Vienna), HAMMERNJK (Prague), DRASCHE (Vienna), KÖRNER (Gratz), REMBOLD (Innsbruck), SCHRÖTER (Vienna), ROKITANSKY (Vienna).

It may be accepted as an historical fact that, apart from a few individuals, the school of SCHÖNLEIN, with the clinical professors allied to it today throughout the German Empire, has, on the whole, outlasted the schools of SKODA and OPPOLZER. It has shown greater vitality and has been more fruitful in scientific achievement, especially in the succeeding generations. Since all three men worked along the same lines, and since for three decades Vienna has been the Mecca for young physicians of all nations, it cannot be assumed that most of the intelligent and talented students were attracted only to SCHÖNLEIN. On the contrary, as most of his pupils also took the courses at Vienna, it is fair to conclude that it was essentially SCHÖNLEIN's personality and method that formed the attraction and attached to him precisely the kind of men who were congenial to him, constitutionally resembled him, and were able to work along his lines.

All three clinical teachers (SCHÖNLEIN, SKODA, OPPOLZER) were distinguished by their careful, objective investigations, their quick understanding and interpretation of the phenomena before them, and their ability to synthesize them into the concept of an individual disease-process. What gave SCHÖNLEIN his great advantage was his extraordinary, encyclopedic knowledge of the natural sciences, his complete command of the physiology taught in his day. He had it all at his finger tips, so that his students constantly traveled with him down the broad streams of science, physiology and practical medicine, blending theory and practice into one. At every moment they experienced the joy of seeing what they had already learned, practically demonstrated and confirmed at the bedside. The therapy followed, so to speak, as a self-evident inference of the disease-process as presented. SCHÖNLEIN, like OPPOLZER, took special delight in effecting a cure (this was characteristic of KRUKENBERG), in medical skill at the sick-bed. Both men were virtuosi of the physician's art, and in this they resembled each other. In the case of SKODA and OP-

POLZER, however, there was always a gap between medical art and modern physiology—between practice and theory—that was artificially and ineffectively bridged over. With SKODA, anatomical diagnosis usually seemed the sole objective. It was hard to credit him with therapeutic ideas. OPPOLZER'S and SCHÖNLEIN'S therapy gave the future young physician a certain amount of confidence. SCHÖNLEIN was especially absorbed in etiology, and in the tremendous phenomena of epidemics and of social diseases. They were to him akin to great manifestations of nature,—processes so greatly interesting in themselves as to be worth studying for their own sake. This appreciation of the big things in natural phenomena and in social life was almost entirely absent in SKODA and OPPOLZER. From them one learned excellent procedure for medical practice, but from SCHÖNLEIN one acquired at the same time imperishable values for one's whole life. People admired SKODA in his unique greatness, and found themselves compelled to love OPPOLZER; but anyone who came into close intellectual contact with SCHÖNLEIN received from him inspiration and enthusiasm for medicine as a science relating to nature as a whole, as well as to the fate of all mankind. From SKODA and OPPOLZER their students generally gained the often rapidly cooling sense of actual practical knowledge; with SCHÖNLEIN they had, besides, unending enjoyment in the limitless fields of research, intimately related to every phase of general knowledge. Therein, I believe, lay the great strength of his teaching which bore such splendid fruit.

SURGERY

Let us not forget that CONRAD GESSNER of Zurich (1516-1565) compiled the first collection of the most important surgical works in Germany; that his friend FELIX WÜRTZ of Basel (d. 1576), HIERONYMUS BRUNSCHWIG "of the house of Salerno" (b. 1430), and HANS VON GERSDORFF of Strassburg (about 1520), were in their way excellent surgeons, who were already criticising independently the tradition handed down to them from Northern Italy and France. Let us not forget that the surgeon GRIFFON of Geneva trained the excellent FABRY VON HILDEN (1590-1634), that JOH. MURALTO (1655-1733), who emigrated from Italy to Zurich, was a prominent surgeon in his day, and that with these men the German school of surgery was born in Switzerland. Nevertheless it is easy to see that the influence on these men of Paré (1517-1590) and of his immediate predecessors and successors was very pronounced, and that we shall have to list as the first entirely independent German surgeon **Lorenz Heister** (1683-1758). He is especially noteworthy as the first important surgeon who taught as professor of surgery at two small North German universities, Altorf and Helmstädt (which have since disappeared), and who was a very fertile German writer in the field of scientific surgery. It is interesting to note that Heister, like the above-mentioned founders of German anatomy, physiology, and clinical medicine, brought his knowledge from Holland. His teachers were Ruysch, Rau, Verduyn, Boerhaave, Bernhard, Albin, and Bidloo.

It may be partly due to the limited scope of his activity at Altorf and Helmstädt that Heister founded no personal tradition; he seems moreover to have been a scholar rather than a teacher. I have been able to discover only that Mauchard (1690-1751), who was later professor at Tübingen, was his pupil at Altorf, although even he acquired most of his knowledge at Paris. How great Heister's literary influence was can be measured from the fact that his handbook, which had been published at Nuremberg in 1718, was being used at Vienna as the official text-book as late as 1838. Since Hippocrates, Galen, and Avicenna, no handbook has served so long (120 years), not even the standard works of Ambroise Paré in his own country. The first text-book on surgery after Heister's which met with pronounced success in Germany, and in which the whole of French and English surgery and the results of the early modern German scientific surgery were gathered together, was that of Chelius, of which the first edition appeared in 1821.

Eminent as were the literary successes of these men, it is nevertheless impossible to say that the German surgeons of today are their pupils. Especially in surgery it is evident that personal tradition is far more effective than any book. Even in Heister's time general education in Germany was limited to so small a number that the seeds sown by him fell on hard ground. In those days France and England were too far in advance in the study of science for Germany to be able to compete with them. Modern German surgery, of which we can now say without being charged with chauvinism, that it is beginning to dominate all civilized countries, is based chiefly on a French, and to a lesser degree on an English foundation. In France

Paré's spirit raised up generations of surgeons to whom the Germans journeyed as the Mohammedans to Mecca. Petit, Garengeot, Morand, Le Dran, Louis, Sabatier, Desault, Percy, Ravaton, Chopart, Richerand, Depelch, Dupuytren, Larrey, Velpeau, Roux, Ricord, Civiale, Leroy, Nelaton, are the masters from whose hands we have received our traditions; while at the same time we acquired much of our best knowledge from the writings of Cheselden, Alexander Monro, Samuel Sharp, William Bromfield, Percival Pott, William and John Hunter, Benjamin Bell, Astley Cooper, Brodie, Lawrence, Liston, Syme, and Stanley. I do not hesitate to say that in my opinion it is only in the last forty years that we can speak of a national German school of surgery and of a German tradition, perpetuating itself through teachers quite independently developed in Germany and carried forward by young men prepared in the German scientific tradition.

Apart from Heister's literary influence, we observe since the end of the last century the development of a large number of German surgeons in widely different parts of Germany, who show scarcely any connection with each other, but who all sought and found their training as surgical clinical teachers in Paris. They formed several more or less important schools, the most important members of which I shall name in conjunction with their teachers. Aside from these many German-French founders, there are several who were more indirectly influenced by French-Italian-English surgery, and who pursued their studies chiefly at Vienna; and finally several who developed themselves almost altogether independently.

Zacharias Platner (1694-1747), professor at Leipzig, and Burkhard Mauchard at Tübingen studied together at Paris under Winslow, Petit, and Gerard.

Platner's friend and successor was Gottfried Gunz (1714-1794); he too went to Paris to study under Le Dran, Guerin, etc.

Samuel Schaarschmidt (1709-1796), Schmucker (1712-1786), Theden (1714-1797), Bilguer (1720-1796), Mursinna (1744-1832), and Johann Goerike (1750-1822) form a connected group of surgeons who were trained partly at Strassburg, partly at Paris (Schmucker was a special student under Le Dran), and who had been developed and had become distinguished in the wars of Frederick II. Later they had taught, some of them at the *Collegium medicum,* and some at the *Pepinière* at Berlin, but they produced only a few disciples. I can think of only one, C. W. Wutzer (1789-1858, Münster, Bonn), who has gained fame through his pupil O. Weber (Bonn, Heidelberg, 1827-1867), although the latter has attained his position in general surgical pathology solely through his own efforts.

Ferdinand von Leber (1727-1808), at Vienna, who has been mentioned above among the anatomists, was not trained in Austria, but during the régime of Van Swieten and De Haën he had a great reputation as a surgeon. Many strangers came to him, although it is difficult to see wherein his greatness as a teacher lay. If Conrad Martin Langenbeck (Göttingen, 1776-1851) studied surgery in his protracted sojourns at Vienna in 1798 and in 1802, then Leber, Steidele and Brambilla (1728-1800 at Milan and Pavia, a student under Grazioli and Beretta) must have been his teachers, although they were then very old men. Hunczowsky (1752-1798), the talented pupil of Steidele, who had been trained at Milan by Moscati, and at Paris, at the special request of Joseph II, by Petit, Sabatier and Louis, was already dead. In any case it remains doubtful whether C. M. Langenbeck is to be counted among the surgeons of the Vienna school. It is far more probable that **Gottlieb August Richter** (1742-1812), his predecessor at Göttingen, most influenced him. Richter had been educated at London, Paris, Amsterdam, and Leyden. As a physician he followed the maxims of Stoll (the older Viennese tradition). It is worth noting, and is probably due to the paucity of surgical material at Göttingen, that Richter's influence was felt chiefly through his writings. He can hardly be said to have founded a school through personal teaching.

I do not know if **C. M. Langenbeck** ever studied at Paris, but after the battle at Belle-Alliance he came in contact with many English and Belgian physicians. His son Max is a physician at Hanover, his nephew Bernhard at Berlin has become the founder of the greatest German school of surgery. Of this I shall have more to say later. Locher, Zwingli (d. Zurich), and Mieg (d. Basel) are the immediate pupils of C. M. Langenbeck.

I must again refer to Leber, inasmuch as a product of his school is **Johann Nepomuk Rust** (1775-1840), a native of Austrian Silesia, who studied at Prague and Vienna, and then became professor of surgery at Olmütz and Cracow, and later directing surgeon at the

Imperial Hospital at Vienna, where he wanted to establish a clinic, but was refused permission. At the request of the Prussian Minister von Hardenberg he then left Vienna and entered upon a large sphere of activity as professor of surgery and later as chief surgeon of the Prussian army. He trained many able military surgeons, but his general education and his knowledge of physiology and anatomy did not suffice to enable him to train modern academic successors. Only Blasius (Halle 1875) can be called his pupil, so far as I know. Through Rust many a tradition of the school of Leber-Kern has come to Berlin.

Another pupil of Leber, **Vincenz von Kern** (born at Gratz 1760), was far more important. Like many other teachers of surgery of that time he had first been a surgeon's apprentice under guild rules, and had served at Salzburg, Trieste and Venice before coming to Vienna, thus probably bringing with him Italian traditions of practice. On Leber's recommendation he became personal physician to the Duke of Sachsen-Hildburghausen, after whose death he made a trip through Germany, Italy and France to study medical progress. He later resumed his studies under Barth, Leber and Stoll, was given the degree of doctor of surgery, and in 1797 became professor of surgery at Laibach. In order to demonstrate how necessary he thought the combination of surgery and medicine, he in 1799 gained the degree of doctor of medicine at Vienna. As a physician he was a follower of his teacher, Stoll. Then he went to Italy again, in order to study lithotomy under Pajola at Venice. In 1805 he began his work as professor of practical surgery, and in 1807 brought about the establishment of the Operator's Institute. In 1824 he gave up his clinic to his pupil Wattmann, and died in 1829 at Vienna.

I have stated all this in detail because in several books I have read between the lines the theory that Kern was entirely a self-educated man. This is true rather of his teacher Leber, who seldom went outside the walls of Vienna. Kern was beyond doubt strongly influenced by Italian surgery, which had already been imported into Vienna by Brambilla. Taking into consideration the fact that in the days of Kern there were no railroads, it is safe to say that none of his successors has traveled so much in the interest of his own education as did Kern, who was especially fitted to be a teacher, precisely by virtue of his well-rounded medical education. In most of the biographies of surgeons of that period we feel his tremendous personal influence on all who came to him. Between 1805 and 1824 he can be counted among the great European teachers of surgery and comparable to his most famous contemporaries at Paris and London.

With the aid of the roster of the pupils of the Operator's Institute, which I have before me, I am able to survey Kern's school in so far as it has spread in Austria. Of the 81 operators in Kern's time, 26 have become professors and 9 first surgeons (directors of surgical wards) in large hospitals. The large number of medico-surgical schools which at that time still existed made it possible for so many young men to get into advantageous positions. Kern's most important pupil is probably Luigi Porta at Pavia, who is still living, and whose brilliant work elicits ever renewed admiration. The professors Faboni (physiology), Signorini (surgery) and Giaçomini (medical clinic) at Padua were pupils in the Operator's Institute under Kern in 1821-1823. The following developed at Vienna: Rosas, later a pupil and successor of Beer; Hager, later professor of the surgical clinic at the Joseph Academy, and **Joseph von Wattmann,** Kern's successor (1824-1849). Most contemporary surgeons in Austria have come from Kern's school or from the schools of his followers. Among them I might name Francesco Cortese, professor of anatomy at Padua, now Chief Military Surgeon of the Italian army at Rome, Franz Schuh (d. Vienna, 1865), Aloisio Vanzetti (professor of surgery at Charkow, now at Padua), Johann von Dumreicher (Vienna), Johann von Balassa (Pest, d. 1869), Lumnitzer (Pest), Friedrich Lorinser (Vienna), Carl L. von Sigmund (Vienna), Zsigmondy (Vienna).

Two pupils of Wattmann, Schuh and Dumreicher, became his "twin" successors.

Out of **Schuh's** school came Rzehaczek (Gratz), Bryk (Cracow), Salzer (Vienna), Weinlechner (Vienna). Among **Dumreicher's** pupils were Dittel (Vienna), Linhart (Würzburg), Seybert (d. Vienna), Mosetig (Vienna), Hofmokl (Vienna), Albert (Innsbruck), Nicoladoni (Vienna).

One of the first assistants of Kern at Vienna between 1805 and 1807—even before the founding of the Operator's Institute—was Ignatz Friz, a Croat, who later became professor of surgery at Prague. Friz's last assistant was **Franz von Pitha** (Prague, Vienna). Although trained in the practical traditions of Kern, he soon formed his own views through independent study and much travel.

He founded a school which was begun at Prague and continued at Vienna until his retirement, when the Joseph Academy (Josephinum) was dissolved in 1873.

To this school belong BLAZINA (Salzburg, Prague), MORAVEK (d. Würzburg), GÜNTNER (Salzburg), FISCHER (d. Innsbruck), PODRAZKI (Vienna). SOCIN (Basel) was also won over to surgery by PITHA, whose pupil he had been at Prague, and under whose direction he worked at Verona in 1866.

We must return to the last century to find new sources. The first name that calls for mention is **Caspar von Siebold** (1776-1807), who has been listed above among the anatomists. He studied at Leyden and then served as physician for some time in the French army. His sons and grandsons have already been noted.

Philipp von Walther (1782-1849), physiologist and surgeon at Landau, Bonn and Munich, belongs to those German surgeons who, without special teachers of surgery, developed under the influence of the French natural scientists. WALTHER studied for a long time at Vienna (where JOH. PETER FRANK, BEER and KERN were his teachers), and may be regarded as a product of the Vienna school in the same sense as C. M. LANGENBECK.

His immediate pupils are CAJETAN VON TEXTOR (1782-1860), MAX JOSEPH CHELIUS (Heidelberg) and PAULI (Landau). **C. von Textor** is also a pupil of BOYER, SCARPA, and the Viennese professors BEER, SCHMIDT, KERN, ZANG. He became the successor of BARTEL VON SIEBOLD at Würzburg. His pupils are his son, CARL VON TEXTOR, and MICHAEL JÄGER (d. Erlangen). FRANZ RIED (Jena) is a pupil of JÄGER; RIED's pupils are SCHILBACH (Leipzig) and DEMME (the elder, d. at Bern), WILHELM (d. Munich), ROTHMUND (Munich). NUSSBAUM (Munich) is a pupil of ROTHMUND.

M. J. Chelius completed his studies at Vienna under ZANG, KERN and BEER, and then went to Paris. Among his immediate pupils I know only his son (Heidelberg, Dresden).

Beside PHILIPP VON WALTHER we must especially mention **C. F. von Graefe**, one of the most important of the self-educated men who appear in the history of surgery, even though he was later influenced at Vienna by the above-mentioned members of that school. His immediate pupils are JÜNGKEN (d. 1875, Berlin, whose pupil is FISCHER, at Breslau) and F. W. G. BENEDIKT (1785-1861, Breslau).

Under the influence of VON GRAEFE and VON WALTHER there arose in Germany a number of surgeons who have taken a more or less independent eclectic position, and have given to German surgery a distinctive character. These surgeons may be divided into two groups, and their pupils in turn belong to both groups:

1. *Modern German surgeons with a predominantly practical tendency.* To these belong the entire schools of Vienna and Prague. Only SCHUH inclines more in the direction of physiology. The successors of VON GRAEFE and VON WALTHER are also in this category, although the latter is in reality the founder of the physiological group of German surgeons.

J. F. Dieffenbach (1795-1847) was influenced pre-eminently by VON WALTHER, and to a lesser degree by DUPUYTREN and LARREY. In Berlin he first became substitute for RUST, and later the successor of VON GRAEFE. Among his immediate students were BUROW (d. Königsberg), BÜHRING (d. Berlin), PAUL and MIDDELDORPF (Breslau, 1824-1866). The latter was at first a physiologist of the school of PURKINJE and J. MÜLLER.

L. Stromeyer, influenced first by his teacher HOLSCHER (Göttingen, but trained in England), then by HIMLY (Göttingen), VON GRAEFE (Berlin) and the great English surgeons. His pupils are HECKER (Freiburg, whose pupil is SCHINZINGER, at Freiburg), BECK (Freiburg, Karlsruhe), THIERSCH (Munich, Erlangen, Leipzig), FR. ESMARCH (Kiel). The last named began as a student of physiology; he was also a pupil of B. VON LANGENBECK at Kiel.

G. B. GÜNTHER (Kiel, d. Leipzig; his pupils were BENNO SCHMIDT, Leipzig), M. W. VON MANDT (Greifswald, St. Petersburg; MANDT had a pupil named KNEIP, d. Greifswald).

WERNHER (Giessen), of the school of RUST-GRAEFE and influenced by the Parisian school.

G. SIMON (professor at Rostock and Heidelberg), of an entirely independent trend.

2. *Modern German surgeons with a tendency chiefly in the direction of anatomy and physiology.*

W. BAUM and COËTAN VON DIEFFENBACH (Berlin, Danzig, Greifswald, Göttingen). The latter began teaching late in his career, hence of the many pupils in whom he aroused enthusiasm for surgery (BILLROTH, who was later a pupil of B. VON LANGENBECK, LOHMEYER, G. FISCHER) few occupy professional chairs.

V. von Bruns, anatomist at Brunswick, later surgeon at Tübingen. His son Paul Bruns was his pupil.

W. Roser, who began as a student of anatomy under the influence of Malgaigne, later surgeon at Marburg. His pupils include W. Koenig (Rostock), C. Hueter (also a pupil of B. von Langenbeck, Rostock, Greifswald).

Bardeleben, anatomist at Giessen, surgeon at Greifswald and Berlin. His pupils are Pohl (Greifswald, d. Danzig), and Heinecke at Erlangen.

Wilms, a pupil of the anatomist Schlemm at Berlin, surgeon at Berlin. His pupils were E. Rose (Zurich), Schoenborn (Königsberg). The latter was also a pupil of B. von Langenbeck.

O. Weber (Bonn, Heidelberg), mentioned above as a pupil of Wutzer, at first more interested in pathological anatomy.

B. Volkmann, a pupil of his father at Halle, later a surgeon, self-developed. His pupils are Lossen (Heidelberg), Schede (Halle), Colberg (d. Kiel), Alfred Bidder (Mannheim), Steudener (Halle).

I have refrained from naming **B. von Langenbeck** until now, in order to close this summary with an account of the strongest influence on the training of our contemporary German surgeons. He began as a lecturer in physiology at Göttingen, and then became professor of surgery at Kiel, and later at Berlin. His immediate assistants and students are: Fr. Esmarch (Kiel); whose pupils in turn are Völkers (Kiel) and Peterson (Kiel).

Führer (d. Hamburg).

A. Wagner (Danzig, d. Königsberg).

W. Busch (Bonn). His pupils are D'Outrelepont (Bonn) and Mosengeil (Bonn).

M. Müller (Cologne).

E. Gurlt (Berlin).

C. Fock (d. Magdeburg).

Th. Billroth (Zurich, Vienna), whose immediate pupils and assistants include V. Czerny (Freiburg), A. Menzel (Trieste), Fr. Steiner (Vienna), C. Gussenbauer (Vienna), R. Gersuny (Vienna), V. Georgievic (Belgrad), A. Frisch (Vienna), A. von Winiwarter (Vienna).

A. Lücke (Bern, Strassburg), whose pupil is C. Kocher (Bern).

Schoenborn (Königsberg); Trendelenburg (Berlin), Bohse (Berlin), Kroenlein (Zurich, Berlin).

The physiologico-anatomical training which B. von Langenbeck gives his students, and which has been extended by them to the best of their ability, is, in addition to his personal influence, the chief reason for the fertility of his school, which still continues to grow.

OPHTHALMOLOGY

German ophthalmology has developed from two points of departure: from Göttingen, from the work of A. G. Richter, who had pursued his studies in France, Holland, and especially in England; and from Vienna, from the work of Barth (the anatomist named above), who was sent to Paris at the instance of Empress Maria Theresa, in order to study ophthalmology under Wenzel. The Göttingen influence, which in the beginning was by far the more important because of Richter's great talent, soon began to wane. On the other hand, the Viennese source, which at first was not so productive, grew as a result of the work of two pupils of Barth, A. Schmidt and G. J. Beer, to be one of the greatest scientific streams of influence that have ever been known in Germany. Ad. Schmidt, who by order of Joseph II was officially taught by Barth (the latter evidently being reluctant to share his secrets), was the less important of the two. George Joseph Beer, who had worked only casually under Barth as a draughtsman, but had caught many of his ideas, and who had been rejected as a pupil by Barth, became by far the more powerful branch of this current.

The further development of Richter's school may be traced by noting that Himly was an immediate pupil of Richter, and, in turn, the teacher of Von Ammon (Dresden), Radius (Leipzig) and Th. Ruete, who was called from Göttingen to Leipzig in place of Ritterich (whose pupil, Coccius, teaches at Leipzig), a pupil of Beer; so that here we have a confluence of the two streams. C. M. Langenbeck at Göttingen had learned his ophthalmology at Vienna from Beer. So had the elder F. von Graefe. Von Graefe's most important pupil, Jüngken, was a Viennese product of Beer and of Friedrich Jäger. It has already been pointed out that Phil. von Walther, whose favorite field was ophthalmology, was a pupil of Beer, and that Dieffenbach was Von Walther's pupil.

The following are the immediate pupils and assistants of **George Joseph Beer** (1763-1819): 1. At Vienna: Friedrich Jäger (1784-1871), also a pupil of Adam Schmidt, and the latter's successor at the Joseph Academy. He influenced all the foreign physicians who came to Vienna as much as did Beer. His immediate pupils are Sichel (Paris), Wecker (Paris) and his son Edward Jäger (Vienna); also Zehender (Bern, Rostock) and Seitz (Giessen). Von Rosas was Beer's successor at the university clinic. His pupils were Blodigk (Gratz), Piringer (Gratz), Stellwag von Carion, the successor of Friedrich Jäger when the Joseph Academy was reorganized.

2. At Prague: **Joh. Nep. Fischer.** His assistants and pupils were Ferdinand von Arlt and Hasner von Artha. Von Arlt's immediate pupils and assistants were Rydl (Cracow), Wecker (Paris), O. Becker (Heidelberg), Mauthner (Innsbruck, later a pupil of E. Jäger), Schulek (Klausenburg), and Sattler (Vienna).

Albrecht von Graefe (1828-1870), who at the time of his father's death was only twelve years old, and during his student days showed much general interest, but no definite inclination toward any particular field, gained his love for ophthalmology from Arlt at Prague. In this branch of the science in which he later distinguished himself, he received his training from Arlt and Jäger at Prague and Vienna, and later from Desmarres and Sichel at Paris, and from Bowmann in London. The discovery of the *speculum oculi* by Helmholtz (1852), the progress of the science of optics, especially through the work of Listing, the study of the pathological histology of the eye, begun by H. Müller, had furnished the new material with which the young Hercules began to work. But the masters of the master, comparable with the teachers of Raphael and Mozart, were Beer, Jäger and Von Arlt. In its scope and success Von Graefe's school can be compared only with those of Boerhaave, Haller, Beer, Boër, Schönlein, J. Müller and B. von Langenbeck.

His pupils have in their turn trained famous pupils. The effect of his work is felt in all parts of the globe; and many of the Viennese and Prague oculists who have been named in the foregoing pages, indeed even his teachers, have felt his influence directly or indirectly, and have been compelled to accept his titanic creations. Of his pupils I shall name here only those who hold professorships at

German universities. They are Schweigger (Berlin), Saemisch (Bonn), Foerster (Bonn), Manz (Freiburg), Leber (Göttingen), Schirmer (Greifswald), Alfred Graefe (Halle), Völkers (Kiel), Jacobson (Königsberg), Wells (Würzburg), Rothmund (Munich), Dor (Bern), Horner (Zurich), Schiess (Basel), Förster (Breslau).

Many others are scattered through Germany, Russia, England, among them Liebrich (a pupil first of Helmholtz, then of Von Graefe, Berlin and London), Waldau (Berlin), Pagenstecher (Wiesbaden), etc.

OBSTETRICS

Obstetrics had formerly been part of surgery, and in its operative phases had been chiefly in the hands of the guild surgeons. In the surgical works of Fabry von Hilden, Lorenz, Heister, etc., we therefore find obstetrics and ophthalmology treated as parts of surgery. Steidele and Lebmacher were still teachers of surgery and obstetrics as one subject at Vienna, and not until 1814 does Boër appear in the faculty at Vienna as a full professor of obstetrics.

As one of the first eminent German obstetricians I must name J. G. Roederer (1726-1763) who had been trained in Paris, London and Leyden. He founded the Lying-In Hospital at Göttingen in 1751. His pupil, and Levret's, G. Stein, the elder, founded similar institutions at Cassel and Marburg (1772). The predominantly French influence of Levret was continued through Fr. B. Osiander (1759-1822), Naegele (Heidelberg), the younger Stein and his pupil Busch (Berlin). It still prevailed for a while at Vienna, from which institution J. H. N. Crantz (1722-1799) was sent to Paris to study obstetrics under Levret.

Lucas Johann Boër (1751-1835) is looked upon as the founder of German obstetrics. He was originally a pupil of Caspar von Siebold at Würzburg, so that in his general scientific training he can be assigned to the Leyden school. After studying without results under Von Störck and Lobmacher at Vienna, he was sent by Joseph II to England, France and Italy, adopting especially the English teachings and methods (Smellie), and transplanting them to Vienna.

At Leipzig the traditions of Boër were continued by Joergk, at Prague by Junkmann, at Vienna by Horn, Klein and Bartsch.

Out of the **Prague school** came KIWISCH (d. Würzburg), SCANZONI (Würzburg; his pupil P. MÜLLER, Bern), SEIFERT (d. Prague), LANGE (Heidelberg), SÄXINGER (Tübingen), BREISKY (Bern, Prague), HOLY (Gratz). The pupils of KLEIN at Vienna are SPÄTH (Vienna, also a pupil of BARTH), C. BRAUN VON FERNWALD (Innsbruck, Vienna), G. BRAUN (Vienna).

The pupils of **C. Braun** are KUHN (Salzburg), KRASSNIG (Klagenfurt), MADUROWICZ (Cracow), C. MAYERHOFER (Vienna), CHROBACK (Vienna), CARL ROKITANSKY (Vienna), FUNK (Vienna) and BANDL (Vienna).

Most of the German obstetricians have studied for considerable periods at Prague and Vienna, so that the influence of BOËR continues to a certain extent down to our own time. But in the German Empire the school of NAEGELE has gained the upper hand. He is looked upon as the founder of the new German physiological school of obstetrics.

SPIEGELBERG (Breslau), BRESLAU (d. Zurich), came from the school of E. VON SIEBOLD at Göttingen. The school founded at Berlin by **Elias von Siebold**, and continued by **W. H. Busch** (a pupil of the younger STEIN at Marburg) and by **Martin** (Jena) became the most widespread. Among its pupils were CRÉDÉ (Leipzig, his pupil SCHÜTZ, at Rostock), W. F. HECKER (Munich), VEIT (Bonn, his pupil C. SCHRÖDER at Erlangen), OLSHANSEN (Halle), B. SCHULTZE (Jena), HILDEBRANDT (Königsberg), GUSSEROW (Utrecht, Zurich, Strassburg), WINCKEL (Rostock, Dresden), FRANKENHÄUSER (Jena, Zurich).

The pupils of **Hohl** at Halle are LIZMANN (Greifswald, Kiel), and PERNICE (Halle, Greifswald).

MEDICAL AND SURGICAL SPECIALTIES

I have had too little opportunity to study the history of the German schools of pharmacology, medical jurisprudence, public sanitation, and of psychiatry, to be able to estimate the personal influence exercised by any prominent individual. I must therefore leave it to others to complete in these particulars the picture outlined above.

In regard to the treatment of diseases of the ear, I might say that its modern development received its impetus about two decades ago from TOYNBEE in London. It was VON TROELTSCH at Würzburg who gained renewed prestige for this field in Germany. His work and instruction soon spread over the greater part of Germany, and there are now competent teachers of diseases of the ear at many German universities. The Vienna school (GRUBER, A. POLITZER) and the Berlin school (LUCAE, SCHWARZ) have attained the greatest success in this branch. It calls for a certain amount of heroism in a man to sacrifice himself to this, therapeutically the most thankless and limited, phase of surgery.

Although the members of the various German schools were much interested in diseases of the skin, especially in acute eruptions and above all in small-pox, this specialty was quite independently developed for Germany by **Hebra** at Vienna, even though not entirely uninfluenced by CAZENAVE and BATEMAN. The two men who sought to accomplish as much at Berlin, SIMON and VON BAERENSPRUNG, both went insane.

HEBRA, as teacher and investigator the most brilliant pupil of SKODA, and creator of his now universally accepted science of skin diseases, must be counted among the greatest teachers of modern times. With his immediate pupils (PICK, WERTHEIM, AUSPITZ, ROSNER, GEBER, J. NEUMANN, KAPOSI) he still rules this domain with undisputed authority.

It was **Türk's** and **Czermak's** prompt and correct application of GARCIA's invention of laryngoscopy to physiological as well as pathologico-diagnostic and therapeutic purposes, which has most recently enhanced the reputation of Vienna. TÜRK, who died in 1867, had already acquired a reputation as an investigator in the field of nerve pathology. The development of the Vienna school of laryngoscopy begins with TÜRK (STÖRK, VON SCHRÖTER, SCHNITZLER), while CZERMAK, by means of his demonstrations during his travels through Europe, developed this discovery with extraordinary rapidity. The concentration of clinical material in the Imperial Hospital, and the thoroughness of the school in question, caused most of the young foreign European and American physicians to study and to practise this important method of examination and treatment at Vienna, while in the German Empire the clinical instructors, VON BRUNS (Tübingen), ZIEMSSEN (Munich) and GERLACH (Würzburg) mastered and further developed the new method, and at Berlin, LEWIN and TOBOLD practise and teach it as their specialty.

Incidentally, I might observe that generally speaking Prague has proved a much more fertile soil for the development of new scientific schools of thought than Vienna. Whenever since the founding of the latter university attempts have been made in this direction by calling men from France, Italy, Holland, Germany, Bohemia or Hungary, the results have very soon proved to be highly volatile. Probably an important reason for this lies in the fact that we have so often made the mistake of transferring to Vienna professors who had grown old at smaller universities and were already more than half worn out, with the result that the warm sun of the capital city soon completed the process of mummification. Nor is it an advantage for Vienna, Berlin or Munich that their professors are so little inclined to leave and go elsewhere: it can only be taken as a symptom of relaxing energy. Austrian professors usually think of a professorship at Vienna as the final goal of their careers, an attitude which often kills the last remnant of their none too exuberant ambition.

Personality and Teaching.—Since I have taken most of the data on which the foregoing compilation is based from reliable sources, so far as the men still living are concerned—and I cannot sufficiently thank my colleagues to whom I have applied, for their kindly and prompt assistance—the account may in general, and in all essential particulars, be regarded as correct and fairly complete. Some objection may be raised as to the wisdom and the value of such a compilation. I was chiefly concerned, as I stated at the outset, to prove that in actual practice it is the *personal influence* of great men that gives rise to schools, and not the special administrative efforts of a government to found them. There is only one way to train capable university teachers—one way that has been practically tested—and that is to secure for the universities the services of the most distinguished men of science, and to furnish them with the necessary equipment for their teaching.

The question whether a Schönlein, if he had been born and educated at Königsberg three decades earlier, would have become the great man that he was, is just as idle as the question whether Schiller, if he were to be born in Mecklenburg today, would become all that he now is in the eyes of the German nation. That the right men appear at the right time on the stage of a nation's history is not merely the result of a happy chance; it is vitally related to the growth of civilization among the people as a whole. Great artists and scholars do indeed seem to create the history of civilization, just as men of great political and strategic talent seem to make political history, but they can accomplish their object only if the soil from which they have grown has been properly cultivated. And it is an interesting fact in the history of German civilization that while for centuries the German nation permitted itself to be fertilized by the culture of other nations, and was itself almost unproductive, it has since won its place in world history with extraordinary speed and energy, not only in the arts, but in philosophy and in the natural sciences.

The German nation has accumulated so much cosmopolitan knowledge, that its national achievements, once its fetters were loosed, immediately became international. German science is rooted in international soil, and was therefore born as a world science, without, however, lacking a national character, of which precisely its universal quality is a prominent feature. The governments of the states in the empire can do a great deal to cultivate the soil for art and science. They can furnish light and air and sun for strong and beautiful plants by removing disturbing impediments. Skillful gardeners ought to be able to decide early which plants they ought to favor. But just as the law of heredity in the organic world again and again breaks through and defies the most powerful external circumstances, so the gardener must know above all else what is the genus and what the ancestry of the trees which he is planting. If he lacks this ability, all his gardening will be wasted.

How shall we know the men who are fitted to be the founders of schools? That, to be sure, is a secret which thus far has not been discovered, and will probably never be discovered. Robert Schumann, equally brilliant as a man and as a musician, includes in his "Musical Maxims for Home and Life" the statement "Perhaps only the genius quite understands the genius." That holds in the field of science as well as of art, and in the last analysis it can be reduced to that mysterious phenomenon of sympathy and antipathy among people, which on closer intercourse so quickly joins them together or puts them asunder. Of course I am here speaking of people, of *humans*—not of persons who never feel either sympathy with or antipathy toward anyone.

The study of many biographies, together with my own observations, have led me to classify effective university teachers into two categories.

Two Types of Effective Teachers.—Both types have in common an innate interest in their work, the irresistible impulse to express their ideas—the urge to teach and the consciousness that they are able to teach. Teachers of the one type, from whom the students can usually acquire the greatest amount of positive knowledge, possess in a high degree the formal talent of systematically presenting the material. They derive pleasure from so doing, and find a satisfaction in making this systematization as clear and thorough as possible. If they cannot be called highly charged batteries or "live wires," they are at least excellent conductors. They like best to teach scientific finalities, and either do violence to what is scientifically undetermined, or avoid it entirely. These are the teachers who most strongly influence the average students, and who achieve most of the immediate practical successes. Under them people prepare for examinations, and if they also conduct the examinations, the students are in luck. They give general satisfaction in all their state and domestic relations, get early appointments, and have the usual public career. They are fathers of families, and beget worthy descendants.

Such excellent teaching of the existing body of knowledge, in the best sense of the term, is the basis of all school training, not excepting the university. It is beyond doubt the absolutely necessary beginning. Often, too, it provides sufficient training for men of greater talent, who then make their way in the field of literature, history, or research on their own initiative.

It is known of the two most exalted, gifted and revolutionary masters of German music, Mozart and Beethoven, that they were taught by men who, themselves devoid of any trace of genius, were purely formal pedants in the theory and technic of music. In teaching, and especially in teaching large groups, the importance of form and method must not be underestimated. On the contrary, we must acknowledge their great pedagogical significance, and therefore spare no effort to perfect them.

But in spite of the great advantage of method in teaching, it has certain serious defects. The tendency to force the material to be taught into fixed forms, the constant repetition of the same content in the same form, leads in the course of years, even with the best teachers of this category, to a rigid dogmatism which finally makes of them, like antiquated text-books, mere milestones to mark the progress of the gradually advancing world. With the enormous progress of the sciences in our day, this petrification may take place after a mere ten or fifteen years. However much these predominantly formalistic minds may seek to absorb new ideas and provide themselves each year with a veneer of new learning, very little rubbing of the modernized surface will show that it is, after all, only a fresh coat of paint and not a new color emanating from within. Chagrin at their lessening success—which they cannot understand, since they believe themselves to be as able as in their earlier years—is the result of the life-work of these indispensable teachers. In the face of their waning effectiveness their only consolation lies in the reflection that everything in the world is growing worse, and that in the "old days" everything was better.

There are exceptions among these men: teachers who, without being themselves productive, possess marked receptive and reproductive ability, and who, with all their tendency to external formalization, are inwardly alive. Training and spirit are in them united with a great power of assimilating their daily acquisitions, and with a sort of eager and active enthusiasm for their work as scholars and teachers, qualities that are normally possessed only by creative minds. Such men are eminently effective at the universities. They are themselves inwardly stimulated by all that is new, and if at times they try to incorporate new ideas somewhat violently and curiously into their systems, yet their own stimulation is conveyed to the student, whom it fructifies, edifies, and inspires. Such men at times awaken slumbering talent, but they are seldom the sort of single-minded men of science who found schools of a distinctive character.

Speaking now of the founders of schools, the powerful magnets who draw men to themselves from far and near, I believe I am justified in saying that the great investigators and physicians have always been of a somewhat visionary, highly imaginative nature, with an urge toward universality; so that the moment they began to speak of their science they gave their students the impression that they were inspired. Most of them, I believe, had marked artistic inclinations; not infrequently they were at the same time poets, painters and musicians, and however much they differed from one another in their personality, they had for younger people an irresistible attraction, almost a sacerdotal, demoniac power. I find it hard to put what I wish to say into words, and I shall therefore let a "genius speak about genius." Philipp von Walther says of Joh. Peter Frank, in discussing the influence which this eminent teacher exerted upon Döllinger: "It is impossible to describe the vital influence that J. P. Frank exerted over his pupils. Since I too had the good fortune in later days to sit at the feet of the great master at Vienna for three full years, I can speak out of my own experience. Nobody has made such a great and lasting impression on me as J. P. Frank. His precepts fell like refreshing dew on receptive minds. We owe to him not merely the facts that we learned, but also stimulation to independent research, the breaking of the fetters that had bound our minds. And certainly Döllinger learned the art of teaching, in which he excelled, and in which he attained his greatest glory, chiefly from J. P. Frank. Even J. P. Frank's heresies were instructive, and only men incapable of independent thought or self-elevation would make the great master responsible for the mistakes which they, relying on his word, made at the beginning of their medical practice,—disastrous as these may have been to the patients committed to their care." In this beautiful tribute Philipp von Walther, the lucid thinker, the distinguished and scholarly physiologist, surgeon and ophthalmologist, speaks of his teacher with a devotion that is usually reserved for a favorite poet or for a beloved woman.

Griesinger, so precise in his external appearance and cautious in his scientific work, says about Schönlein: "Who, having seen him, would not first of all remember his calm, earnest, sure manner, his thorough examinations, his reserve in forming conclusions until he believed he had thoroughly grasped the case,—and then his firm, carefully considered, clearly defined utterances? It was his habit to give the results of his investigations in brief, close-knit, and complete form; and he did this in terse, colorful language, which did not shun even the robust colloquialisms of the South German, if he thought them suitable. He had the courage of his convictions, and glossed nothing over. Given to assertion rather than to demonstration or argument, he seemed to be a master rather than a minister of nature. To his pupils his utterances often sounded like the *dicta* of nature herself; indeed it seemed to me at that time that he knew *everything.*" No matter how much the critical Griesinger may later have criticised Schönlein's school, his enthusiasm for Schönlein, the teacher, remained unabated.

No one has ever paid a finer tribute to his teacher than Johannes Müller to Rudolphi. "Rudolphi was no less great as a man than as a scholar—*integer vitae scelerisque purus.* Anyone who knew him was bound to love and respect him, and even though his frankness of speech might sometimes hurt a little, one could not long resist his charm. What above everything else he demanded of people was righteousness, honesty of mind, and freedom from all unworthy motives. Where he found these qualities, he gave himself without reserve, and never again allowed himself to be deceived by appearances. This real self finds expression in his poems, in which he often speaks of friendship. Whenever I recall his frank, cheerful, dignified features, his kindly seriousness, the energy and integrity of his character, I am deeply moved. *In any ignoble mood I should avoid looking at the portrait of my fatherly counsellor, and it is when I recall the noblest experiences of my life that I think at once of Rudolphi.*"

The words I have here italicized seem to me the finest thing that any man has ever said of another. Since finding this quotation, I have read it times without number. It re-echoes in my soul like a theme from Beethoven, Schubert or Brahms!

The Influence of Great Teachers.—Some of my readers may object that in my discussion of the importance of the personality of great teachers, in my enthusiasm for the persons themselves, I have thrust the more important matter—the new discoveries of these great men—too much into the background; that it is, after all, the original achievements of these leaders of thought that influence their students and their times, and that, therefore, the written word will accomplish the same result as, and make a more permanent impression than, the fleeting utterances of the teacher. There is a germ of truth in this contention. We cannot doubt that the writings of Kant, Joh. Müller's text-book in physiology, and other epoch-making works, have had far greater influence than the personal activities of their authors. It is even true that the indirect effect of these great men is felt far beyond their own generation. On the other hand, the influence of such important publications is usually felt *after* the completion of one's university course, and even then only by those who are capable of appreciating works of originality. But again, our experience in the field of medicine shows us that even important founders of schools have often been unproductive in a literary sense. Among these were Dupuytren, Schönlein and Oppolzer. To be sure, these are exceptions, and as a rule the fame of such men is less permanent than the reputations of those who were able writers; for only the latter can be subjected to careful criticism by the historian, while the purely personal work of great scholars is often hard to evaluate properly after their death. After all, the scholar's real work takes its concrete form in the books he publishes. Only a few of the younger generation know anything of the extraordinary influence of a Peter Krukenberg, or of a Heim; and the men named above will share the same fate, while much less able men who have put their ideas into well-constructed books will at least be mentioned in later historical works, and will have to be noted as steps in the great stairway to the temple of science. It has been given to only a few mortals to be at the same time good teachers, skillful writers, creative investigators, and masters of masters.

It is the difficult task of the official in the Department of Education who is charged with the administration of the universities to bring about and to maintain a proper mingling of all the elements that are needed for the permanent efficiency and reputation of a faculty. These elements exist in the German nation in abundance; and if the proper mixture is not achieved, the fault lies altogether in the limited ability of the ministerial advisers concerned.

Wherever this ideal blend is found, and where a faculty works together harmoniously, there develops a faculty school sustained not only by so many individual teachers, but by the co-operation and solidarity of all. But if we consider the brilliant periods in the history of medical schools, as, e.g., those at Vienna, Prague, Würzburg, Göttingen, Berlin, Tübingen, Leipzig, etc., we usually find that the real magnets at these schools were not the teachers of formal medical routine, but the distinguished investigators, whose elemental strength helped to uphold the others. When these men of power leave, the minds that depended on them all too soon become anemic.

Now that the system which we call the scientific-hippocratic method of research has been universally adopted, there are no longer schools in the field of natural and medical science, in the sense of a union of men formed to spread and propagate their common views. Marked differences there will always be when it comes to detailed investigations, but there is no longer any doubt about the principle and the method of investigation. No one doubts that knowledge of the truth is the aim of all research, no matter how sharply this truth may conflict with our social, ethical and political conditions. This, I repeat, and I shall repeat it frequently, is the unifying bond of the modern university.

There is still another opinion that I must combat, which is cherished, at least in secret, by many able men—by men who are well-wishers of the universities, but who have hazy notions about the manner of cultural progress, and about the gradual evolution of a people or a race to a higher plane. I refer to the idea that it is enough to have efficient teachers at a university, and that geniuses are rather an ornament, a luxury, but really of little practical value; that they are frequently unintelligible to the great mass of students, and are not needed to train the latter for their professions, retarding rather than advancing them. I have done justice to the importance of the predominantly pedagogical teachers, and am far from underestimating their effectiveness as useful, indispensable exponents of civilization. Among scholars they are what the able, solid citizen class is in the body politic—the foundation on which the entire structure rests. I must add that among them are men who, as pupils of the most distinguished teachers, have inherited the spirit of their masters, who cherish that spirit and hand it down to their students. There are transitional generations in which scientific qualities pass from teacher to student, just as such generations appear in all fields of physical heredity. But if a succession of such generations should follow one upon another, the most vital of the inherited qualities would soon wane and finally disappear. I have already pointed out how great is the danger that even the ablest talents may become petrified in the routine of formal teaching.

Teaching alone will not suffice, because the standard of all knowledge must constantly be raised, if it is not to be left as a stagnating bog far below the level of general cultural progress. But the powers of the pedagogue are not sufficient to accomplish this intellectual and universal raising of the whole field of knowledge. This elevation to ever higher viewpoints, or as we say, keeping our science strictly up to date, demands great powers of original creation and attraction. We must never forget that a university education aims to train men not only to know their fields, but to be artists in their fields—well-rounded men who, scattered to the four winds of heaven, will again become pioneers of culture.

Not merely what a man learns at a university, but what is there made of him, decides his future life. The power that draws the students to a given teacher may be to them inexplicable and mysterious—nevertheless they will involuntarily imitate him in his manner of thinking, feeling and acting, at least until they develop some originality of their own, if such is in them. They have the vague impression that, without remembering much of what he said in his lectures, they are with his help penetrating the secrets of nature, are acquiring the ability to recognize the truth, and just that feeling has an infinite charm for every thoughtful, meditative young man. It awakens his delight in his work, fills him with enthusiasm, and in later years he will easily find for himself the ways and means of acquiring positive knowledge, after he has reconnoitered the field in which he is to work—the field which he has discovered under the guidance of his teacher. Even though much of this may be lost by the man who for various reasons must confine himself to a narrow professional career, he will still retain the consciousness that at least once in his life he has looked out upon the Promised Land; and in this consciousness lies a joy that must be experienced to be appreciated—a joy that becomes the inner pride of his whole life. The greater the number of men in a nation who with their own eyes have beheld this ideal world of science and art, the higher is the cultural level of that people. Only in a soil so cultivated will the finest talents grow into a force that shall fructify not only their own country, but the whole world.

The Cost of Training Physicians.—Every state must reckon with circumstances which it may indeed be able to alter, but only very slowly and after many difficulties have been overcome. And since the government is obliged to deal with conditions as they are, it follows that the state is, after all, limited in what it can do in a material way for education and culture. That it must first of all use its resources to assure its own existence, we may accept as a political axiom. All other needs can be considered only when that has been accomplished. We are here specifically concerned with the questions:

"What does a well equipped medical faculty cost the government? How much does it cost to produce a competently trained physician?"

I am not unaware of the fact that most of my colleagues abhor the discussion of such questions. Many of them would like to make an even greater mystery of the matter than it is at present, while others consider a more paternalistic relation of the government toward the universities to be the only right thing. I do not share these views; on the contrary, I believe that in this field, too, there should be as much enlightenment as possible among the professors, in parliaments and in the ministries. It would certainly not be amiss to put before each faculty annually a statement showing what they and the whole university have spent.

Salaries.—I have gathered the following information concerning the salaries of professors at German universities:

In Prussia, Hesse, Baden, Mecklenburg, Weimar and Alsace, there is no law standardizing the salaries of professors. It is the custom not to go below a fixed minimum, but there is no legal maximum. Present conditions in Prussia can be gleaned from the approved state budget of 1875, which I have before me. According to this the salaries of the full professor were:

Königsberg	M. 1,800–5,100
Berlin	M. 3,600–7,200
Greifswald	M. 3,300–5,400
Breslau	M. 3,600–7,200
Halle	M. 3,300–5,700
Kiel	M. 4,200–6,000
Göttingen	M. 3,600–7,500
Marburg	M. 3,600–6,000
Bonn	M. 4,200–6,600

The minimum is found at Königsberg (M. 1,800) and the maximum at Göttingen (M. 7,500). Kiel and Bonn have very high average salaries. There is no mention of perquisites, or of pay for extra work, but many professors have free residences, and some receive a rent allowance.

In the following countries the salaries of professors are fixed by law:

Switzerland.—The full professors at Basel and Bern receive Fl. 2,000-3,000, at Zurich Fl. 2,500-4,000. At Bern the maximum is fixed at Fl. 5,000. The adjunct professors at Basel are not salaried, at Bern they receive at most Fl. 1,600, at Zurich Fl. 1,000-2,000. The Boards of Education of these republics have, however, funds at their disposal with which in special cases they are enabled to give personal increases, or in some way to add to the salary if it becomes necessary in order to keep a good teacher. As a result there have been salaries at Zurich of Fl. 11,000 and free residence. This is certainly a noteworthy achievement in a state of about 250,000 population, which supports its own university.

Russia.—At Dorpat the salaries are fixed, for regular professors at 2,400 rubles, and for adjunct professors at 1,700 rubles. But there, too, there are ways of increasing the salaries in exceptional cases.

Württemberg.—At Tübingen there are three salary classes:

Class I	M. 4,400
Class II	M. 4,000
Class III	M. 3,600

Whether there are extras, perquisites or rent allowances there, I do not know.

Bavaria.—The salaries of full professors for all three universities (Munich, Würzburg and Erlangen) are fixed at Fl. 2,600, and for adjuncts at Fl. 1,500; there is, moreover, provision for increases after five years of service. After the first quinquennium the full professor receives an additional Fl. 200, and the adjunct professor an increase of Fl. 100. Thereafter the salaries of both grades increase by Fl. 100 every five years. In Munich every full professor receives Fl. 350, and every adjunct professor Fl. 280 a year as a bonus to meet the high cost of living.

Austria.—The salaries of the individual professors have often been regulated, but the standards have seldom continued for any considerable length of time. I have already stated that individual salaries at the time of Van Swieten were extraordinarily high.

In modern times a "Provisional Order" regulating the salaries was issued by the Ministry on October 28, 1849. The law now in force, dating from April 9, 1870, provides as follows:

"Section 1. The regular minimum for full professors in the non-theological faculties is fixed at Fl. 2,200 at Vienna, Fl. 2,000 at Prague, and Fl. 1,800 for all other universities.

"Section 2. These salaries for each of the professors mentioned in Section I will be increased by Fl. 200 after each five years which the person in question has served as full professor at Austrian universities, up to and including the twenty-fifth year of service."

This order went into effect, including the professors already in service, on December 25, 1874. In addition, the full professors who have no free residence receive a rental allowance of Fl. 400, and the recently established "bonus" (law of April 15, 1873), which varies with the individual teachers, according to their rank and class, from Fl. 200 to Fl. 800 annually. With these additions the legal minimum salary of the full professor at Vienna ranges from Fl. 2,800 (salary Fl. 2,200, rental allowance Fl. 400, bonus Fl. 200) to Fl. 4,400 (salary Fl. 2,200, rental allowance Fl. 400, bonus Fl. 800 and quinquennial increases after 25 years of service Fl. 1,000). Professors who sign special contracts with the government upon appointment do not receive these bonuses and salary increases.

The Minister is, however, empowered to go beyond these salaries at his own discretion, by virtue of the following paragraph of the law of April 9, 1870. Paragraph 3: "If circumstances demand it, individual professors may be granted higher salaries than those fixed by law, as well as other inducements."

Calculating the salaries in German Reich Marks and expressing the result in round numbers, we arrive at the following table:

Württemberg	M. 3,600–4,400
Switzerland	M. 2,400–4,800
Bavaria (Munich)	M. 3,500–5,500
Prussia	M. 3,466–6,300
Russia	M. 7,000
Austria (Vienna)	M. 5,000–8,000

It is evident that the minimum salaries of the full professors at Vienna are the highest, as are also the maximum salaries there (entirely apart from the extras). There are, for example, seven men who receive between Fl. 3,000 and 6,000 (M. 5,500-11,000), while in Prussia the salaries at only Göttingen, Berlin and Breslau reach M. 7,000 and rarely exceed that amount. The maximum salaries at the other universities vary between M. 5,100 and M. 6,000.

Professors' Pensions.—In Austria it is provided in the Pension Law of April 9, 1870 (Paragraph 3), that "Every professor who has completed his seventieth year is to be automatically retired on his full salary at the time of retirement, including any salary increase that may be due him at that time. Notwithstanding the fact that he ceases to be a member of the professors' council, he shall retain not only the right to vote in granting academic honors, but also the right as honorary professor to announce and deliver lectures at the university in a manner to be determined by the Minister of Education.

"Paragraph 4. All professors *may,* when they have reached the age of sixty-five, likewise be retired in the manner described in Paragraph 3."

This last paragraph is essentially the same as the Imperial decree of August 16, 1862 (Ministerial decree of September 5, 1862) according to which university professors who have served continuously and satisfactorily for thirty years or more may, on their own application, be retired on their full salary at the time of retirement.

"For widows of full university professors a pension of Fl. 500 is fixed." (Paragraph 2 of the Pension Law of April 9, 1870.) If the professor has reached a higher rank, as for example the rank of "Hofrat," the pension to his widow is higher. The Widows' Pension Fund of the Medical Doctors' Council, to which nearly all members of the Professors' Council belong, provides especially favorable conditions.

On the whole, these provisions may be regarded as particularly favorable. Retirement from active duty at the age of seventy is certainly a good provision, which can in no way reflect on the man concerned, because it is the law.

The conditions at Dorpat are even better. There every professor may retire on full salary after twenty-five years of service. I am told that such pensioners, if still quite capable, are occasionally reappointed, and then for a time draw both pension and salary. That cannot happen in Austria. The Austrian Minister of Education has no authority to increase pensions, but he can considerably increase the salary of a specially deserving professor shortly before his retirement, which automatically increases his pension.

The pensioning system at the Swiss universities is, in general, bad. The Swiss republics avoid giving pensions by employing no one for life, but always for a fixed term of years. In the Canton of Zurich only professors and clergymen are excepted from this rule, and now there is a move to abolish this exception. At Bern a full professor can be retired after fifteen years of service, because of old age, or because of sickness, on one-third of his salary. At Basel a professor dismissed for old age or sickness receives "appropriate compensation." At Zurich there is no legal provision in the matter.

There is no law determining the age of retirement in Russia, Switzerland, or the German Empire. In the states composing the Empire there is no pension law for the teachers in the different types of state schools. Every teacher works as long as he can, and when a professor can no longer perform his duties he can be retired with the title of "professor emeritus." Such men are required to announce courses, but they are not compelled to give them; they remain in full enjoyment of the faculty emoluments (fees for the doctorate examinations and for the degrees), retain their seats and vote in the faculty, and are also eligible to academic offices. Professors may apply to be retired to this status.

In practice there is no great difference between pensioning a professor and making him an emeritus, but there is an advantage in fixing the seventieth year as the age of retirement, partly so that the state may not postpone the appointment of younger men out of motives of economy, and partly in order that retirement may not be too long postponed out of too great consideration for the person concerned, to the detriment of the effectiveness of the faculty.

In case a professor in the states of the German Empire must be pensioned because of his becoming incapacitated, the rules governing the pensioning of public officials apply. The following examples indicate only slight differences between the states in this respect:

In Bavaria the pension in the first year of service is seven-tenths of the salary, in the second year it is eight-tenths, and thereafter it is nine-tenths. After forty years of service the professor has the right to retire, and to receive nine-tenths of his salary. Every professor may demand to be retired at the age of seventy, with a pension equalling his full salary. His widow receives 22% of his salary, and every minor child 4.4%.

At Giessen the professor may be pensioned after forty years of service on 90% of his salary. In Rostock the professors are never granted pensions, but they continue to draw their salaries and extras if incapacitated by illness or old age. At many German universities there are Widows' Pension Funds, to which every professor must contribute. The assessments and the benefits vary greatly. In Leipzig, for example, the annual contribution is M. 60 annually, and the widow receives M. 1,200 per year.

Conditions of Appointment and Service.—There still remains the question of the conditions under which professors are appointed, and especially of the services demanded of them in the different states. The professors ought to be grateful that the state lays only a general claim to their services as teachers of the various subjects, leaving it to them and to the faculties to determine in what manner they shall teach and how many hours they shall devote to their work. The confidence in the professors, which the state expresses in permitting this very elastic relationship, honors both the faculty and the professor, but on the whole this condition does not conform to the clearly defined contractual relationships between employer and employee that prevail in general in our times. Although the quality of scientific and pedagogic work is as little capable of contractual definition as is the quality of artistic performance, it does seem to me feasible to determine approximately the amount of time per week to be spent in teaching, and to take this factor into consideration in fixing salaries. The Swiss republics have taken statutory action in this respect. According to their laws a full professor at Bern, Basel and Zurich must lecture at least ten hours a week. This is stated in the official appointment, and is an important point in the contract between the individual and the state. I thoroughly approve of this measure, although I know that the majority of German professors will find it extremely distasteful. Many of them even abhor the thought that they stand in a contractual relation with the state and are bound by mutual obligations. I cannot see why the precise definition of this relationship should lessen the dignity or the scientific spirit of the professors.

The Contractual Relation.—Such a uniformity of service and of contractual relations has several important consequences. For example, in the weekly minimum of ten hours of teaching, the members of the faculty (the council of professors) will at least be giving the state an equal amount of service, with the result that little specialties will not be expanded into full professorships, but, on the contrary, several lesser fields will often be combined into one professorship. The outcome of this principle would be equality of salaries for all full professors, and such equalization is the goal of every state. Nevertheless, if a state wishes to lay claim to a particularly high quality of teaching, or to gain distinction through the brilliancy of its university faculty—which may be anything but mere vanity—it will have to pay the higher price in salaries and other inducements, which these great and indispensable minds command in the open market. The constitution of the German Empire, with its professional freedom for physicians, will gradually weaken local patriotism, in the sense that every professor at every German university will be equally conscious of working for the whole nation, and not merely for the country in which he happens to be born. The exchanges of students and professors will increase, and the professors will have less patriotic scruples about changing their positions, if opportunity should offer them better conditions, either in the form of a larger sphere of activity, or a higher salary, or more comfortable social circumstances. The intermingling of the various German stocks, which is greatly to be desired, will also contribute to the furthering of this interchange of professors; and all the advantages as well as disadvantages of free competition will be more sharply emphasized.

In view of the surplus of productive forces and of excellent teachers in the field of the natural and medical sciences wherever German is spoken, there is no danger that their price will become extravagantly high. Should this ever occur, the German states will probably find a way to protect their interests by mutual agreement.

Tuition Fees.—Among the much debated academic questions is the matter of tuition fees. The democratic—or perhaps more properly the social democratic—point of view, that the state is only in duty bound to provide free public schools of one uniform quality in which everyone learns the same things, so that no one may become wiser than his fellows, in order to create no imequality, may be ignored, since, with the exception of certain parties in some of the Swiss cantons, no one has ever taken it seriously. The majority of German states have expressed themselves as in favor of compulsory education, and also in favor of tuition fees, even in the public schools. We may assume, then, that in Germany it is for the time being an accepted principle that the governments must provide for higher instruction and for professional schools.

But the state bears only a part, even though the greater part, of the cost of these institutions; the students contribute the remainder. They must pay for their instruction and for the privilege of being examined and receiving a qualifying certificate. This seems entirely justifiable, inasmuch as the number of taxpayers who enjoy the benefits of these state institutions personally and directly is very small; and it therefore seems fair that these few should have to bear an extra tax for such special privileges. There is substantially no difference of opinion in the German states regarding the principle that the students should pay for the instruction they receive at the state schools, for the examinations and the certificates that are issued to them; and I may therefore spare myself the trouble of adducing arguments in support of this view and of refuting objections. Naturally, the only question with which we are here concerned is the expediency of this plan for Germany. It surely is not necessary to point out that without fees no schools can exist.

The so-called "course fees" at the German universities differ from the usual school fees in that the money goes to the professors personally as an honorarium, while the school fee goes into the school fund, or directly into the state treasury. In the former case it is usually spent for educational purposes at the school in question; in some schools a part of it is distributed among the teachers, according to fixed rules.

It would be a very interesting study to pursue the history of the course fees and their connection with the changing phases of university organization. But to do this, a mass of documentary material would be needed, which is to be found only in the archives of the universities and is not at the moment accessible to me. So far as I have been able to study this matter at the University of Vienna, the matter has been variously administered at different times.

In the first centuries of the university's existence the students had to pay considerable sums into the faculty treasury. Out of this money and the fees for degrees, the professors paid themselves; for at first they received no salary, and later their salaries were very small and irregularly paid. The existence of universities which did not possess large endowments was absolutely dependent on the tuition fees. I do not know on what basis the money was divided. In view of the customs of the times, it is quite unlikely that a master of surgery accepted apprentices to be trained for membership in the guild without compensation. Whether at several of the German universities the custom of paying tuition fees was ever dropped, and then reintroduced, and when this happened, I cannot say, nor can

I tell when the present universal practice at German universities was introduced, according to which every professor personally receives the fees of the students in his courses; though they are now generally paid through the office of the bursar of the university.

At Vienna, as long as there were compulsory courses and the students were divided into years, a fixed annual fee was paid to the university by the students, for which they were entitled to attend the lectures in the class to which they were assigned. Later there were courses and lectures in addition to the regular program of studies, and for these each student paid a fee directly to the professor or lecturer. Shortly before academic freedom in teaching and the elective system were introduced at the Austrian universities by the General Education Law of October 1, 1850, course fees were regulated by a Ministerial order of July 12, 1850. These were at first paid at the end of the semester; now they must be paid, as at the other German universities, at the beginning of the semester (Ministerial decree of September 13, 1870).

We assume that every student should pay something for the instruction he receives. If such payment were entirely abolished at the universities, the work of the private lecturers would be paralyzed, for we cannot expect them to lecture without any compensation whatsoever. Nor is it reasonable to expect a student to pay a lecturer for a course that he can take under a professor free of charge, unless the lecturer gives a mere coaching class designed to put students through the examination. This sort of course has no place in the university curriculum.

Where there is school organization and a compulsory course, the students usually pay their annual or semi-annual fees into the school treasury. Thence it usually flows into the state funds, or at some institutions (as, for example, the polytechnic schools) part of it, at least, is paid to the teachers who give the courses, usually on the basis of the number of teaching hours. No difficulties arise, because the number of pupils studying under each teacher is the same, since all in a given class must take the prescribed lectures. Just as competition between teachers in the same subject is eliminated by this arrangement, so no individual teacher can have more or fewer students than his colleague. Thus the quality of his work has no bearing on his compensation. It matters not at all whether he puts his students to sleep by his dullness, or even falls asleep himself, as has happened, or whether by his talent, his conscientious preparation, and his inspiring presentation, he creates in his pupils an enthusiasm for the subject which he teaches. His ability or otherwise neither increases nor lessens his audience or his income. Consequently untalented and lazy teachers must be carried along by the talented, active ones, or the school goes to ruin.

These conditions, as they existed in former days at the Austrian universities, and as they exist even now at the French *Écoles de médecine,* sometimes result in a frightful stagnation in scientific matters, and sometimes in the development of a system of substitutes. The teachers allow their assistants and aides to lecture for them as frequently as may be, thus withdrawing from the burden of continuous teaching, which has no more charm for them than the performance of any bureaucratic duty, whether of a government official or a day laborer. In addition to their official duties, the more energetic teachers used to give private lessons, in which they taught earnestly for pay, and in the semester examinations this system led to the direst consequences. Official orders were frequently issued prohibiting teachers from coaching privately in those subjects which they were supposed to teach in course; but such strictures were of little avail. Men show an incredible resourcefulness in evading laws.

Needless to say, with such a system even the most talented private lecturers could make no headway against the dullest of the regularly appointed professors. Students registered in the regular course have no time to hear the chief subjects taught a second time by lecturers outside the faculty, nor can they afford the additional cost which such repetition would involve. The official appearance of the curriculum deceives the student into believing that what is taught in the prescribed courses is sufficient to fit him for his profession; and this idea also tends to reduce the number of men interested in a more detailed scientific presentation of interesting minor fields.

Fees and Academic Freedom.—It would appear, then, that the system of "course fees" is intimately bound up with the question of academic freedom, of the elective system, of reciprocity among universities, and with the system of private lecturers. Only if attendance at lectures is altogether voluntary, and entirely independent of the division of students into year groups, can the teacher, by virtue of his talent and enthusiasm, attract students in unlimited numbers. Ambition is fostered when several professors and lecturers teach the same subject. In such a case everyone works with all his might to draw as many hearers as possible. I need not point out that this competition is greatly encouraged when the result is not merely a full auditorium, but an audience of high-class men.

People have often demanded of science that it descend from its Olympian heights, and become more human and practical. If, on occasion, precisely this occurs, other voices are raised in opposition: "The growing materialism of these professors is terrible. They are supposed to pursue purely ideal objects, and yet they accept pay for it!"

It is possible to have highly idealistic aims in view, and still desire material rewards for the exceptional quality of one's work, or the extent and versatility of one's achievements. The Biblical words "to him that hath shall be given" are valid in all competitive fields. Shall we reproach a professor for making his work attractive to young people, increasing his own capacity through untiring effort, or seeking to discover more and more interesting phases of his subject? Is he to be penalized if he develops new forms and methods in keeping with the demands of the time, or if he tries to make his method of presentation more attractive, or even if, without sacrificing scientific accuracy, he cultivates an eloquent delivery? It would be a sad misapprehension of human character and social conditions, were we to deny the influence of personal, material success in raising the standards of teaching. Scholarly pride and the ambition to win promotion can do much in this direction, but the course fees help, for they serve to keep the teacher's efforts at a high level, and compel him to grow continuously.

Competition.—In speaking of competition among university instructors, I am least concerned with competition between two professors or lecturers who teach the same subject at one institution, a situation which could exist only at the larger universities. I am speaking of the competition of the university teacher with all his colleagues in a given specialty at all German universities. With the prevailing freedom of migration among German universities, every professor now stands on a rostrum from which he can speak to the whole nation. All German students are potentially his auditors, and many foreigners besides. And after having become a magnet for the young men of his country, after lavishing upon the coming generation his knowledge of and enthusiasm for the finest ideals of humanity, attracting students to the faculty to which he belongs (since his students will also take courses with many of his colleagues), after having become the pride of his native country and his nation—shall all this yield him nothing of personal advantage, save only his fame and his meager salary? Would that not be a grave injustice, unparalleled in any other walk of life today?

I see a great many of my esteemed colleagues assuming a disdainful air when I speak of competition, and even of the material rewards of competition—matters that should not even be mentioned in whispers in their Utopias of the arts and sciences. Let them create these Utopias for us, but perfect ones, under all conditions! For surely no reasonable person will demand that the scholar should exploit the powers he possesses only for humanity and the state, and not for his own benefit. Some would argue that since the scholar could have gained his knowledge and his ability only under the protection of a civilized state and has probably acquired them chiefly at state institutions and with their help in the form of a state scholarship, he is now bound to make a return to the state that wastes so much money on individuals who return no service—giving his knowledge and ability in return for the assurance of a tolerable living. But this counsel of superpatriotism could be applied as well to the merchant and the industrialist, yet no one demands of them that they give their services to the state at a fixed salary. No matter how much we may love our country and humanity, we have fulfilled our obligations toward the state as a social and financial institution when we have paid our taxes and obeyed the law. In return for their salaries the professors obligate themselves to give a fixed number of lectures, to teach a definite subject to the students who come to them of their own free will. After the state has determined for its own reasons that the students themselves shall pay a certain tax for their lectures, it would be very unjust to exclude the teachers, through whom these taxes are earned, from any participation in the revenue.

Teacher and Student.—There is another reason in favor of retaining the course fees, namely, the personal contact which it encourages between teacher and student. When the student pays his fee directly to the teacher, he entrusts his education, not to the school as such, but specifically to the teacher whom he has himself chosen. The teacher on his part undertakes a personal responsibility for the student who has entrusted himself to his guidance. At the great universities this relation may be somewhat shadowy, but it is very real at the smaller ones. The student puts himself under the master's tutelage and pays him a fee, which is a very different matter from paying his money into a guild treasury and being assigned to this or that master by chance or rotation. For both teacher and student there is in this arrangement an element that fosters a mutually sympathetic understanding. Strange as it may seem to connect academic freedom and the elective system with the payment of course fees, the connection is nevertheless very real.

Only one who has experienced it can appreciate how a beginner in teaching feels when he sees his lecture-room gradually filling up; when he notes with exaltation the fact that students are coming to him, too, and are bringing their course fees to him, just as to the other professors!

Of less importance, and yet worth mentioning, is the advantage which the state gains indirectly through taxes imposed upon the professors' income in the form of course fees. In Austria, the salaries, course fees, and faculty fees are all added together, and a professor is thereby brought into a higher income class, so that income taxes of 6.8% and even 10% are not unusual in the case of some professors.

Having presented the arguments in favor of retaining the course fees, I shall now review the case against their retention.

True Art and True Science.—Material success in teaching, or in any form of scientific and artistic activity, is said to affect adversely the spirit of scholars and artists, and to bring into their lives certain elements that sully the purity of artistic and scientific endeavor. This conception of scholars who live like hermits in lonely cells on herbs and roots, and of artists who need only air and the sun of royal favor, and who must be kept in solitary confinement and direst poverty, in order that they may not lose any of their divine attributes, but, on the contrary, may enhance their creative powers by systematic starvation, is very widespread. But the idea that only those are true scholars who are trained to live like skeletonized anchorites, and that artists of genius can best prove their divine descent by being ragged vagabonds, capable of embodying the highest ideals of humanity in forms of beauty only when drunk with beer, wine or whiskey—such a conception does not correspond to reality, and never has corresponded with it. Nevertheless, it is still deeply rooted in "society."

For most people a high wall is raised between the world of ideals and reality, between theory and practice, between art and handicraft, —a wall whose foundations have been well and truly laid, but which crumbles bit by bit as soon as the scientific investigator puts it to the test. Then it becomes evident that the world on the other side of the wall is also a world of our own imagining, and resembles our world to the last detail. The priests of this false cult assure us that the fall of this wall would be equivalent to the collapse of civilization, though they themselves pass through it by many a secret door, and know very well that the world on the other side is quite like the world over here. Such a wall the false priests of science and art had erected between the world of reality and the world of knowledge and power. They imagined that the prestige of science and art, as well as their own, could be preserved only if they were always viewed through the mist with which they sought to surround themselves, as so-called martyrs and saints floating on clouds, subsisting on nothing. The notions here described, which still prevail among the general public, are the remnants of the priestly mysteries and learned rites of the Middle Ages, and accord beautifully with the Christian sentiment that only the poor shall enter the kingdom of heaven, and that the rich man is already damned for being rich; that poverty is in itself a virtue, and riches are in themselves a vice.

On the one hand, there is the desire that science should become practical, that through the growth of its achievements it should lead, not merely to the uplifting and enlightenment of the popular mind, but to the material well-being of the people. On the other hand, there is the demand that those who accomplish these results shall live a purely spiritual, disembodied existence, aloof from the world. Who can possibly solve such a problem?

The temptation that besets the professors in their capacity of examiners, to exert pressure on each of their students to repeat their courses several times, is thought to be so great that many otherwise sensible men consider it quite impossible for the professors to withstand this temptation. I have acted as examiner for more than sixteen years, and have had the opportunity to hear a large number of my colleagues at Berlin, Vienna and Zurich conduct examinations, but I have never felt that any examiner ever rejected a candidate because he had slighted or ignored his courses. It is very hard to examine rigidly, precisely, and strictly, and to appear amiable and kindly while doing so. Every examiner conducts his tests in a manner dictated by his fundamental character. Pessimists, dyspeptics, professors with chronic catarrh of the stomach and intestines, with hemorrhoids, with itching eczema, misunderstood geniuses, infallibles—these are always bad, nagging, and even malicious examiners. Without wishing to do so, they vent their own discomfort on the candidate, as, indeed, on all with whom they come in contact. Lack of income in course fees is really very seldom the only cause of the bad temper that makes bad examiners. The supervisors, deans or governmental commissioners, or whatever else the controlling functionaries are called, must decide whether the examiner is too hard on a candidate. If they do not fairly and justly perform the duty imposed upon them by the state, then their chronic or momentary laxity is to blame, and not the system of course fees.

If the candidate believes that there are members of the examining board who are ill-disposed toward him, he is not bound to take his examination in that particular place. He may go to a neighboring university, and there take his examination before examiners who are utter strangers to him, as he is to them. We must remember the general human inclination to blame the non-success of our efforts on others and never to assume more than an infinitesimal share of the blame ourselves. It would be just as hard to find a candidate willing to admit that he had failed in his examination because he had learned nothing and knew nothing, as to find a university lecturer who would admit that his failure as a teacher was due to lack of ability.

The unsuccessful candidate is never at a loss for reasons why he failed to pass the examination. The greed for fees is one of the many reasons invented by disappointed candidates.

No matter what public opinion, or parliamentary majorities, or the press, or any other agents of the Minister of Education may say about the matter, the universities would not perish if the course fees were abolished. But all who know university conditions and have given the matter serious thought are agreed that such a step would remove a powerful stimulus to inspiring teaching, an important prop of academic freedom and the elective system, and of the system of private lectureships. It would create an infinite amount of discontent, without any corresponding gain either for the university or the state.

Course fees vary in amount even among the universities of the German Empire, and also, of course, at the universities of Switzerland, Russia and Austria. In Prussia there is in this respect no legal limitation. Paragraph 41 of the present statute of the University of Berlin provides that the amount of the course fees be left to the discretion of the professors. It has become customary for professors teaching the more important subjects not to go below a certain minimum, and to exceed this minimum only on rare occasions. The fee for courses in subjects not included in the examination is altogether unlimited; such courses are designated as *Privatissima*.

At Basel, Bern and Zurich the customary fee in required courses is five francs for each semester hour in the weekly program, but when a course is given more than five hours a week, 25 francs is the usual maximum.

At Dorpat the fee is one ruble for each weekly semester hour—a somewhat lower fee than in Switzerland. At the other Russian universities where courses are all compulsory, the annual tuition fee is 50 rubles—as much as a student at Dorpat pays for a twenty-five hour program.

At Tübingen the fees are legally fixed as follows:

1 hour per week	M. 5
2 " " "	M. 10
3 " " "	M. 15
4 " " "	M. 20
5– 6 " " "	M. 24
7– 8 " " "	M. 30
9–10 " " "	M. 35
11–12 " " "	M. 42

At Erlangen it is customary to charge M. 4 for each hour per week, per semester.

At Göttingen the fees are M. 4 or 5 per hour, and at Breslau M. 3. Fees for each clinic are M. 30. The conditions at most of the German universities are much the same. In general, the fees are somewhat lower than in Switzerland, and higher than in Russia.

At the Austrian universities the full professors must give their courses for the legal minimum of Fl. 1 per semester hour per week. The pertinent paragraphs of the Ministerial order of July 12, 1850, state (Paragraph 3) that the "minimum tuition fee for each semester course shall be one gulden for each hour of the course per week."

Paragraph 5—"Each professor regularly or temporarily appointed on salary must give the courses in his subjects in an appropriate number of weekly lectures for the course fee set forth in Paragraph 3."

In Austria, then, we find the lowest tuition fees. (In Austria Fl. 1, in Russia 1 ruble, in the German Empire M. 3-4, and in Switzerland Fr. 5 per hour per week.) And yet the movement against the course fees is most frequent and active in the Viennese press and in the Austrian Reichsrat. On the other hand, in an anonymous pamphlet issued by some Viennese students, the doubling of the fees is proposed, in order to provide the means to enlarge and to increase the equipment of the laboratories for the more adequate accommodation of the increasing numbers of students.

Cost of Laboratory Equipment.—The expense of equipping and maintaining the laboratories required by a modern medical faculty is far greater than the sum spent for salaries. For Prussia and Austria, on the basis of the estimates for 1875, I present the following tables:

Medical Faculty at	*Salaries of Professors*	*Annual Cost for Laboratories*	*Total*
Berlin	M. 74,000	M. 235,778	M. 309,778
Kiel	M. 44,500	M. 204,915	M. 249,415
Bonn	M. 49,800	M. 169,161	M. 218,961
Königsberg	M. 44,250	M. 156,923	M. 201,173
Greifswald	M. 43,500	M. 129,313	M. 172,813
Göttingen	M. 64,500	M. 108,095	M. 172,595
Halle	M. 50,300	M. 114,056	M. 164,356
Breslau	M. 47,700	M. 88,540	M. 136,240
Marburg	M. 43,808	M. 64,845	M. 108,653
	M. 462,358	M. 1,271,626	M. 1,733,984

Medical Faculty at	*Salaries of Professors*	*Annual Cost for Laboratories*	*Total*
Vienna	Fl. 94,275	Fl. 166,749	Fl. 261,024
Prague	Fl. 72,020	Fl. 78,530	Fl. 150,550
Gratz	Fl. 28,800	Fl. 55,074	Fl. 83,874
Innsbruck	Fl. 29,560	Fl. 35,274	Fl. 64,834
	Fl. 224,655	Fl. 335,627	Fl. 560,282

Even though this table by no means represents the total cost of the medical faculties, as we shall see in a moment, it does show how much actual cash is spent in salaries for medical professors and for the laboratories conducted by them. It brings to light the interesting fact that in Prussia almost three times as much is spent on the laboratories as on salaries, while in Austria the laboratories cost scarcely more than one and one-half times as much as the salaries. Austria spends in salaries for the medical professors of its four universities about as much as Prussia for the salaries of the professors of its nine medical faculties. The case would have to be somewhat differently stated if we were to count the universities of Prague and Vienna as four universities, but even then the Austrian professors would have proportionately better salaries than the Prussian. Perhaps the difference would be equalized if we were to add to the Prussian salaries the rental allowances. On the other hand, the salaries of the professors emeriti in the Prussian faculties are included. Chairs at present vacant are not included.

It is obviously very hard to arrive at any exact calculation. If we take the figures as they stand, the Prussian medical faculties cost on the average M. 192,664 each year (M. 51,373 for salaries, and M. 141,291 for upkeep of laboratories); the Austrian universities cost on the average Fl. 140,070 per year (Fl. 56,163 for salaries and Fl. 83,907 for laboratories). The Austrian faculties therefore cost half as much again as the Prussian. Moreover, many of the Prussian universities have very extensive properties, including expensive real estate holdings, so that the contribution from the state funds is small. I do not know to what extent this is true of Austrian universities. The University of Vienna did at one time own some real estate, but its chief source of income was in certain levies of customs which were assigned to it, but which in the course of time yielded very irregular returns, and finally ceased altogether.

If we use the tables given above (making due allowance for the sources of error, which, when all is said, affect all faculties in about the same measure) for making a computation in terms of national economy, we find the natural assumption solidly substantiated by the figures, namely, that the training of physicians at fully equipped, but little frequented universities is an enormous expense to the state, whereas they may be trained ("produced," to use the Viennese term) much more cheaply at the largely attended universities.

If we add the annual cost of salaries and laboratories of a faculty, and divide by two, and then divide this total by the average attendance per semester, we shall see how much each medical student costs the state in each semester. Multiplying this sum for the Prussian faculties by 8, and for the Austrian faculties by 10, the result will represent what it costs the state to prepare a student for the examination. This calculation may be tabulated as follows:

	Quadrennium
Greifswald	M. 1,216
Marburg	M. 1,268
Breslau	M. 1,472
Halle	M. 2,256
Göttingen	M. 2,324
Bonn	M. 2,528
Königsberg	M. 2,872
Kiel	M. 8,904

	Quadrennium	*Quinquennium*
Vienna	Fl. 376	Fl. 470
Gratz	Fl. 704	Fl. 880
Prague	Fl. 784	Fl. 980
Innsbruck	Fl. 1,852	Fl. 2,315

The "producing" of a physician at Kiel (assuming that the quadrennium prevails at Vienna) costs about eleven times as much as at Vienna. At Innsbruck it is about five times as expensive as at Vienna, where, even with the required five-year course, physicians are most cheaply "produced."

On the whole, all these figures are too low, in the first place because the salaries of the professors of the natural sciences and the cost of their laboratories have not been included. I think it would be fair to charge about half the cost of these departments to the medical schools. No charge has been made for interest on the capital invested in the laboratories, buildings and the land on which the buildings stand. Some charge ought also be made for the library and the general maintenance of the university. When I tried to calculate these items for the different universities, I encountered what were for me insurmountable difficulties. It is not easy to establish the relative value, for instance, of the land on which the laboratories at Giessen stand, and the value of land on the Ringstrasse in Vienna. It is almost useless to compare the value of the two laboratories on the basis of the value of the land on which they are built. If we were to begin to calculate the cost of the existing and projected laboratories at Vienna on this basis, the production cost of physicians at Vienna would rise enormously in comparison with Innsbruck.

A Proposed Budget for a Medical School.—There follows a proposed budget for a Faculty of Natural Science and Medicine that would meet the modern requirements of a German city of moderate size. In framing these estimates, I have proceeded on the principles laid down above.

I—Salaries.

Fourteen full professors for the principal subjects:—Zoölogy, Botany, Mineralogy, Chemistry, Physics, Anatomy, Physiology, General Pathology and Pathological Anatomy, Pharmacology, Internal Medical Clinic, Surgical Clinic, Eye and Ear Clinic, Obstetrical and Gynecological Clinic, Public Health; a librarian with rank of adjunct professor, who should teach the History of Medicine.

Fourteen full professors, at Fl. 4,000	Fl. 60,000
A fund for adjunct professors, and for salary increases where necessary to retain the services of a good man	Fl. 14,000
Twenty assistants @ Fl. 800	Fl. 16,000
Twenty servants @ Fl. 400	Fl. 8,000
Administrative Officers	Fl. 6,000
Total	Fl. 104,000

II—Endowment of Laboratories.

In estimating the endowment of the laboratories necessary for a thorough medical training, I shall be guided by the average cost of those already in existence, without including the salaries of assistants and servants.

1. Zoölogical Museum, Zoötomic Laboratories, Museum of Comparative Anatomy: Fl. 2,000.

Zurich	Fr. 700	(without service)
Vienna	Fl. 4,500	(without service; in addition Fl. 9,739 for rent)
Gratz	Fl. 1,500	(without service)
Prague	Fl. 825	(without service)
Innsbruck	Fl. 500	(without service)

		Service	*Total*
Leipzig	M. 2,400	M. 3,000	M. 5,400
Berlin	M. 22,302	M. 26,760	M. 49,062
Königsberg	M. 6,525	M. 2,850	M. 9,375
Bonn	M. 4,654	M. 6,450	M. 11,104
Breslau	M. 3,156	M. 4,110	M. 7,266
Kiel	M. 3,150	M. 2,700	M. 5,850
Göttingen	M. 3,000	M. 2,400	M. 5,400
Greifswald	M. 2,931	M. 2,775	M. 5,706
Marburg	M. 2,400	M. 3,630	M. 6,030
Halle	M. 2,244	M. 3,492	M. 5,736

2. Botanical Garden, Laboratory for Plant Physiology, Herbarium: Fl. 5,000.

Zurich	Fr. 12,100	(without service)
Vienna	Fl. 11,100	(without service; and an additional Fl. 13,900)
Prague	Fl. 5,700	(without service)
Gratz	?	(without service)
Innsbruck	Fl. 2,000	(without service)

		Service	*Total*
Leipzig	M. 6,900	M. 3,000	M. 9,900
Berlin	M. 92,002	M. 23,080	M. 115,082
Bonn	M. 16,840	M. 4,770	M. 21,610
Göttingen	M. 13,800	M. 4,650	M. 18,450
Breslau	M. 11,715	M. 5,730	M. 17,445
Halle	M. 11,212	M. 3,300	M. 14,512
Greifswald	M. 9,856	M. 2,900	M. 12,756
Königsberg	M. 9,045	M. 3,150	M. 12,195
Marburg	M. 8,340	M. 4,500	M. 12,840
Kiel	M. 4,750	M. 2,150	M. 6,900

3. Mineralogical, Geological and Paleontological Collections: Fl. 1,000.

Vienna	Fl. 1,700	(without service)
Gratz	Fl. 750	(without service)
Prague	Fl. 315	(without service)
Innsbruck	Fl. 300	(without service)

		Service	*Total*
Leipzig	M. 1,800	M. 1,650	M. 3,450
Berlin	M. 6,146	M. 11,190	M. 17,336
Halle	M. 2,600	M. 1,290	M. 3,890
Göttingen	M. 2,550	M. 1,650	M. 4,200
Breslau	M. 2,370	M. 2,145	M. 4,515
Kiel	M. 1,500	M. 1,200	M. 2,700
Marburg	M. 1,200	M. 1,200	M. 2,400
Königsberg	M. 900	M. ——	M. 900

4. Physical Laboratory: Fl. 1,500.

Zurich	Fr. 1,200	(without service)
Vienna	Fl. 2,180	(without service, Fl. 4,045 for rentals)
Prague	Fl. 1,800	(without service)
Gratz	Fl. 1,800	(without service)
Innsbruck	Fl. 800	(without service)

		Service	*Total*
Leipzig	M. 6,000	M. 3,150	M. 9,150
Berlin	M. 6,405	M. 5,010	M. 11,415
Breslau	M. 3,756	M. 2,160	M. 5,916
Königsberg	M. 3,000	M. ——	M. 3,000
Göttingen	M. 2,820	M. 2,880	M. 5,700

		Service	*Total*
Marburg	M. 2,250	M. 1,050	M. 3,300
Kiel	M. 2,160	M. 2,160	M. 4,320
Bonn	M. 1,800	M. 2,700	M. 4,500
Halle	M. 1,800	M. 1,050	M. 2,850

5. Chemical Laboratories, including facilities for Physiological, Pathological, Pharmaceutical and Agricultural Chemistry: Fl. 4,000.

Zurich	Fr. 3,200	(without service)
Vienna	Fl. 3,489	for two laboratories, without service (plus Fl. 800 for scholarships)
Prague	Fl. 2,460	for two laboratories, without service.
Gratz	Fl. 1,850	for one laboratory, without service.
Innsbruck	Fl. 1,600	for one laboratory, without service.

		Service	*Total*
Leipzig (two laboratories)	M. 19,500	M. 8,100	M. 27,600
Bonn	M. 15,083	M. 9,150	M. 24,233
Berlin	M. 12,927	M. 7,440	M. 20,367
Göttingen	M. 9,810	M. 11,940	M. 21,750
Greifswald	M. 7,953	M. 4,530	M. 12,483
Halle	M. 7,944	M. 4,230	M. 12,174
Marburg	M. 7,665	M. 6,720	M. 14,385
Kiel	M. 7,500	M. 3,930	M. 11,430
Königsberg	M. 7,158	M. 3,600	M. 10,758
Breslau	M. 4,439	M. 2,640	M. 7,079

6. Human Anatomy; material and museum; Histology and Embryology: Fl. 3,000.

Zurich	Fr. 800	(without service)
Vienna	Fl. 3,458	two anatomical laboratories (without service)
Innsbruck	Fl. 1,800	(without service)
Prague	Fl. 1,100	(without service)
Gratz	Fl. 400	(without service)

		Service	*Total*
Leipzig (double laboratory)	M. 17,100	M. 7,650	M. 24,750
Berlin	M. 16,185	M. 15,150	M. 31,335
Bonn	M. 11,571	M. 6,705	M. 18,276
Marburg	M. 6,705	M. 2,970	M. 9,675
Greifswald	M. 5,952	M. 5,130	M. 11,082
Breslau	M. 5,580	M. 7,740	M. 13,320
Göttingen	M. 5,410	M. 2,120	M. 7,530
Halle	M. 3,671	M. 4,380	M. 8,051
Kiel	M. 2,475	M. 3,780	M. 6,255
Königsberg	M. 2,474	M. 4,200	M. 6,674

7. Physiological Laboratory: Fl. 2,000.

Zurich	Fr.	800	(without service)
Vienna	Fl.	2,000	(without service)
Prague	Fl.	2,000	(without service)
Gratz	Fl.	2,000	(without service)
Innsbruck	Fl.	1,200	(without service)

		Service	*Total*
Leipzig	M. 9,000	M. 7,350	M. 16,350
Breslau	M. 5,509	M. 2,375	M. 7,884
Bonn	M. 5,200	M. 1,880	M. 7,080
Königsberg	M. 5,070	M. 1,350	M. 6,420
Göttingen	M. 2,610	M. 1,920	M. 4,530
Greifswald	M. 2,520	M. 450	M. 2,970
Halle	M. 2,475	M. 1,980	M. 4,455
Kiel	M. 2,050	M. 2,250	M. 4,300
Berlin	M. 1,753	M. 2,400	M. 4,153
Marburg	M. 825	M. 1,950	M. 2,775

8. Pharmacological Laboratory; Pharmacognostic Collection: Fl. 500.

Vienna	Fl.	500	(without service)
Innsbruck	Fl.	100	(without service)
Leipzig	M.	450	(without service)
Berlin	M.	12,120	(without service)
Bonn	M.	1,330	(without service)
Marburg	M.	1,990	(without service)
Göttingen	M.	1,800	(without service)
Greifswald	M.	900	(without service)
Breslau	M.	600	(without service)
Halle	M.	90	(without service)
Kiel	M.	90	(without service)

9. Social Medicine (Hygiene, Medical Jurisprudence, Public Health): Fl. 500.

Prague	Fl.	100	(without service)
Innsbruck	Fl.	100	(without service)
Berlin	M.	450	(without service)
Königsberg	M.	300	(without service)

10. Scientific and Medical Library: Fl. 4,000.

11-14. Funds for the clinics for the purchase of instruments for the use of the directors and the assistants.

Medical clinic	Fl.	1,000
Surgical clinic	Fl.	2,000
Obstetrical clinic	Fl.	500
Eye and Ear clinic	Fl.	500

15. Maintenance of all clinical institutes: Fl. 70,000.

It is very difficult to estimate the cost of upkeep of the clinics at the different universities. Their budgets show such great variations that even an approach to a norm is impossible. This is due to the fact that some of the universities own and manage the hospitals they use, while other clinics are housed in hospitals belonging to the city, the district, the province or the state, subject to certain specified conditions. The cost of upkeep is again affected by the variations in the cost of living, by the fees charged the patients, and by the number of free beds at the disposal of the instructors for teaching purposes.

In the General Hospital at Vienna there are about 600 clinical beds. For these the Ministry of Education pays the difference between the regular cost of keeping a patient, and the cost of the better treatment their occupants receive. Most of the clinics have, besides, two or three rooms reserved for their use, in which the patients receive only the ordinary hospital care. In this way the number of patients available for purposes of instruction is twice as large as the number of so-called clinical beds.

In 1874 the clinical beds cost about F. 200,000 for about 154,038 patient-days, of which the Ministry of Education provided about Fl. 100,000. This included the cost of administration, service, nursing, maintenance of buildings, medicine, fuel, laundry, lighting, clerical staff, etc. Each bed, which is of course not always occupied, cost Fl. 333 per year.

Let us take as typical for a university of moderate size, a hospital of 250 beds, divided among all the clinics. Taking into consideration the high cost of living in Vienna, I shall reduce the annual cost per bed in a provincial town to Fl. 250. In round numbers, therefore, such clinics would cost between Fl. 62,500 and Fl. 70,000. This does not quite come up to the amount provided in the budget of Kiel for 1875, for the upkeep of the "Academic Hospitals and Maternity Hospitals" (M. 189,000) but it should suffice. The estimate can be reduced to about Fl. 40,000, if we require most of the patients to make some payment.

16. Special fund to cover sums spent in excess of the budget: Fl. 10,000.

The total annual cost of a Faculty of Natural Science and Medicine would then shape itself as follows:—

1.	Salaries	Fl. 104,000
2.	Laboratories	Fl. 107,000
		Fl. 221,000 or M. 422,000

In setting up these budget items I have in no case used the highest amounts spent at any university. As a rule I have limited myself to the average figures, and I am certain that my calculations contain no exaggerations. If four new faculties of medicine and natural science were to be established in Austria, as I have suggested above, about Fl. 844,000 would have to be added to the budget annually, and this sum would not include the original cost of the buildings and equipment.

The interest on the capital invested in the university buildings should also be taken into account. In attempting to include these in the budget, the value of the land must be ignored, and only the value of the buildings taken into consideration, since, as shown above, the value of the land in different places differs vastly.

The table given below will tend to give the reader some idea of the cost of recent buildings, erected on modern principles:

The new chemical laboratory at Zurich	Fr.	364,000
The new laboratory for pathological anatomy at Leipzig	M.	111,000
The new anatomical laboratory at Leipzig	M.	570,000
The physics laboratory at Leipzig	M.	300,000
The new physiological laboratory at Leipzig	M.	168,000
The chemical laboratory at Leipzig	M.	300,000
The anatomical laboratory at Berlin	M.	180,000
The laboratory for physics and physiology at Berlin	M.	1,800,000
The anatomical laboratory at Greifswald	M.	138,000
The laboratory for pathological anatomy at Greifswald	M.	180,000
The chemical laboratory at Greifswald	M.	204,000
The hospital at Greifswald	M.	471,000
The chemical laboratory at Bonn	M.	510,000
The obstetrical clinic at Bonn	M.	600,000
The anatomical clinic at Bonn	M.	351,000
The laboratory for anatomy and physiology at Gratz	Fl.	220,000
The laboratory for pathological anatomy at Vienna	Fl.	198,568
The chemical laboratory at Vienna	Fl.	750,000
The Jewish Hospital of 100 beds	Fl.	550,000

On the basis of these figures the following estimates ought to be adequate for a university in moderate circumstances:

The main buildings of the Faculty of Medicine and Natural Science, the faculty assembly room, the administrative offices, the library, the zoölogical, mineralogical and pharmacological collections	Fl.	400,000
Laboratories for descriptive anatomy, zoötomy, collections	Fl.	100,000
Laboratory for physiology and physics	Fl.	100,000
Chemical Laboratory	Fl.	150,000
Clinical Laboratories	Fl.	800,000
Botanical Garden and inventory	Fl.	50,000
Total	Fl.	1,600,000
or	M.	3,200,000

At five per cent, the interest on this invested capital is Fl. 80,000, which must be added to the estimated annual outlay of Fl. 211,000, making a total of Fl. 291,000 or M. 582,000. In making these estimates, I have assumed that the buildings will be erected as economically as possible, but with all the necessary equipment; also that all patients will receive treatment gratis.

In round numbers, the establishment of a Faculty of Medicine and Natural Science would require one and one-half million gulden, its maintenance 300,000 gulden annually. With a normal attendance of 150 students, and with a five-year course, the cost of training a physician at such a faculty would be Fl. 5,000. This is less than the cost at Kiel, which is computed without counting the cost of instruction in the natural sciences, and does not include interest on investment.

It is to be hoped that before long some wealthy man will donate six million gulden to found a University of Natural Science and Medicine to be called by his name.

The Cost of Armaments and the Cost of Medical Training.—Great as these sums may seem when they are compared with the meager resources of the small German universities, it must be remembered that this money yields a high rate of interest in the advancement of civilization, and in the physical and intellectual welfare of the nation; and that every citizen trained at the university is a center of culture, a sun of greater or less magnitude and power, distributing light and warmth, and life and growth.

When we compare these sums with the amounts the state spends on its military establishment, they vanish into insignificance. This has been so often pointed out that I became interested in reducing the statement to figures. The official budgets of the War Ministries of the larger states were not at my disposal. I did, however, succeed in getting data concerning the cost of the yearly upkeep of regiments of Prussian infantry, cavalry and artillery. I believe these figures may be taken as the lowest in this field, as Prussia is probably unexcelled in watchfulness and severe economy in public expenditure.

Although I am in possession of the itemized statements of these expenses, I cannot assume that the reader is interested in them, and shall limit myself, therefore, to presenting the totals. It should be stated at the outset that the increase in the cost of many items from January 1, 1875, has been taken into account in these calculations.

An infantry regiment of three battalions, each with four companies (altogether about 1,700 men), costs annually about M. 800,000 (more exactly M. 719,996.98), about one-half again as much as the annual cost of the maintenance of a medical and scientific faculty.

The cost of building barracks for such a regiment varies, of course, with different localities, and at different times. At present, in a city of moderate size, it would cost about M. 900,000, without taking into account the price of the land. The capital invested in the equipment of the barracks, and the equipment and clothing of the men, in the training material kept on hand, etc., is estimated at about M. 600,000. Together this amounts to one and one-half million marks. Interest on this sum at five per cent is M. 75,000. Adding this to the M. 800,000 given above, the total annual upkeep is M. 875,000 or about Fl. 437,100.

The capital investment of an entirely new university is greater than that for a newly established regiment, but the cost of maintenance is about the same. The salary of a battalion commander (M. 5,400 salary, M. 702 service pay, M. 660 rental allowance, making a total of M. 6,762, or Fl. 3,618) is about the same as the salary of a fairly well situated professor, and approaches the estimate made above.

The cost of a cavalry regiment is enormously higher. The regiment consists of five squadrons, including 681 men with their petty officers. These cost annually about M. 700,000 (precisely M. 662,055.73). A newly built barracks costs M. 1,800,000 without equipment. The inventory of the equipment distributed to the men comes to about M. 200,000, the equipment of the horses about M. 75,000. The horses themselves are worth about M. 450,000.

The invested capital for a newly established regiment of cavalry is therefore about M. 2,525,000. At five per cent, the interest on this is M. 126,250 per annum, bringing the annual cost of upkeep to M. 826,250.

The annual upkeep of a newly organized regiment of infantry artillery of two battalions is about M. 500,000. That of a regiment of field artillery, consisting of two divisions of four batteries each about M. 655,000. I have not been able to obtain any estimate of the cost of the equipment of such a regiment, since I could not ascertain the prices of new cannon.

By no means would I presume to criticize these expenditures. I am so thoroughly convinced of the high cultural value of compulsory service and of the importance of these institutions in the development and the maintenance of a spirit of national patriotism, that no sacrifice seems too high to maintain these forces at their present minimum strength. Moreover, the money that is spent on them remains in circulation within the country and millions of factory workers and artisans gain employment thereby. Without a strong, thoroughly trained army it is in our day not so easy to promote the progress of civilization in the various states, and to maintain the present political and social order. For without the restraint of the army, the ever-increasing clamor for individual rights and liberties would soon lead to a reversion to primitive conditions in which the strong would be strengthened and the weak enslaved.

My only object, as I have already pointed out, is to show by way of comparison that the sacrifices which the state is called upon to make for the development of science are by no means so great as they seem to be at first glance, if we compare them with other national expenditures.

APPENDIX

APPENDIX

COMPARISON BETWEEN THE AUSTRIAN EXAMINATION AND THAT IN THE GERMAN EMPIRE.

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Examination in Natural History: Subjects of the examination: Botany, zoölogy, mineralogy. Oral only. Presiding officer: The dean of the medical faculty. Examiners: The professors of their subjects. Place: Any Austrian university. No state supervision. Prerequisites: Certificate of graduation from the *Gymnasium;* matriculation. The student may take the examination at any time; he may also take the examination in each subject at a different time. These examinations are given only in the first four weeks of each semester.	*Tentamen Physicum:* Subjects of the examination: Anatomy, physiology, chemistry, physics, natural science (botany or zoölogy or mineralogy). Oral only. Presiding officer: The dean of the medical faculty. Examiners: Appointed annually by the Ministry; no definite number. The professors of the different subjects are usually reappointed every year. Prerequisites: Graduation from a *Gymnasium;* matriculation. May not be taken before the end of the second year and not later than the end of the third year of the course. This examination may be taken at any time of the year. By fixing a time for the examination, passing it becomes a prerequisite for attendance at the clinics.
Examinations for the degree of Doctor of Medicine, with the right to practice in all parts of the Austro-Hungarian Monarchy: Examination conducted by the faculty under state control; may be taken at all universities in Austria-Hungary that have medical faculties. The examinations can be given throughout the year, except during the university vacation.—Conditions for admission to the first section of the examination: 1. Certificate of	*Examination for Physicians, Surgeons and Obstetricians:* State examination; gives the right to use only title of physician, and to practise in all parts of the German Empire, but not the right to use the title of doctor. Can be taken at all universities in the German Empire, and is given by special examining boards; these are filled annually, by appointments made by the Ministries of the different countries. The departmental head pro-

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baptism and birth certificate; 2. Certificate of graduation from a *Gymnasium;* 3. Proof of two years' attendance at a university (carrying a program of at least ten hours per semester) together with proof of attendance for two semesters at dissection courses; 4. Certificate showing that the prerequisite examination in natural history has been passed. Requirements for admission to the second and third sections of this examination: Completion of a five-year university course, together with special certificate showing completion of at least four semesters in medical and four in surgical clinics, two of each as practitioners (Ministerial decree of September 12, 1874) as well as at least one semester in an eye clinic and one in an obstetrical clinic. Proof of having passed the first section of the examination. Each section of the examining board consists of (1) a chairman (the dean, who may be represented by professors chosen annually by the faculty of professors), (2) the regular examiners (professors of the subjects in question; if there are several of these, they may alternate), (3) the government commissioners, who must be doctors of medicine, and (4) a co-examiner, chosen annually by the faculty, and confirmed by the Ministry, to assist in the examinations in medicine and surgery. The co-examiners need not be members of the faculty of professors, but as a rule the same adjunct professors of the various subjects, or specialists, are chosen. They too are

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fessors of the universities form the most important part of these boards, although this is not legally prescribed. The presiding officer may be named from among the members of the boards or may be an outsider appointed by the government. Every section of the examination must be conducted by three examiners. The examinations begin annually in November and may not last longer than July of the next year. Prerequisites: 1. Certificate of graduation from a *Gymnasium;* 2. Certificate of graduation from a university; 3. Proof of having passed the *tentamen physicum;* 4. Proof that the candidate has taken part as practitioner at the surgical and medical clinics for at least two semesters (in each), and that he has officiated alone at at least four confinements in a maternity clinic. (It may be worth noting that the need of a four-year course is not here referred to, but conditions three and four cannot be met without such a course. In these regulations it is evident throughout that the state did not wish to infringe directly on freedom of election, but in practice considered it necessary to introduce indirect limitations of this freedom.)

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designated annually by the faculty of professors and are confirmed by the Ministry. Usually they are medical members of the health board. Only the examiners—and where they take active part, the co-examiners—issue attestations (with ratings). The chairman (dean) has the right, but not the obligation, to examine; but since he has no right to issue attestations, his participation has little meaning. The government commissioner "supervises and inspects all examinations in the public interest;" but since he has no right to veto the result, this again has little practical significance. All that is left him is to convey his disapproval, should there be occasion to do so, to the dean, and then to the Ministry of Education, which has sole control over this examination, whereas medical affairs are under control of a department of the Ministry of the Interior. All these examinations are public.

RIGOROSUM I

Physics, Chemistry, Anatomy, Physiology: The examinations are both practical and theoretical. In anatomical practice a *situs viscerum* or an anatomical preparation must be demonstrated; in the practical test in physiology a microscopic preparation is to be made and demonstrated, and any necessary analysis is to be made. This examination (as already noted above) may be taken after a four-year course, which is the usual procedure; but the candidate has the right to postpone all

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SECTION I

Anatomy: 1. Demonstration of an osteological and an angiological preparation (Specific problems to be drawn by lot); 2. Making and demonstrating a nerve preparation.

Physiology: 1. A histological and a physiological problem. (Specific problems to be drawn by lot.) 2. *Ex tempore* examination in histology. Making and demonstrating a preparation.

Pathological Anatomy: 1. Dissection on the cadaver and demonstration. 2. Making and demon-

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three examinations until after completion of the five-year course.

All these examinations are oral only.

RIGOROSUM II

General Pathology and Therapy. Materia Medica (Pharmacology. Pharmacognosy, Toxicology and Prescribing).

Pathological Anatomy: 1. Practical examination, dissection and demonstration. 2. Theoretical examination.

Internal Medicine: 1. Practical examination at the bedside. "As a rule several patients shall be presented to the candidate either in one day, or in the course of several days." (At Vienna this is seldom done; because of the very large number of candidates, one patient must suffice.) 2. Theoretical examination (a) by the examiner, (b) by the co-examiner.

All examinations oral.

RIGOROSUM III

Surgery: 1. Practical (a) at the bedside (as in internal medicine), application of a bandage, (b) operation on a cadaver. 2. Theoretical (a) by the examiner, (b) by the co-examiner.

Opthalmology: 1. Practical (a) on a patient, (b) operation on the cadaver; 2. Theoretical.

Obstetrics and Gynecology: 1. Practical (a) treatment of a pregnant woman, or of a woman in labor, or of a gynecological case; (b) examination on the manikin: operation. 2. Theoretical.

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strating a pathological-histological preparation. All examinations oral.

SECTION II

Surgery: 1. Clinical. "Each candidate must undertake the treatment of a patient for a period of eight days." A written report on each patient; the candidate may be examined every day for eight days. 2. Technical. Problems assigned by lot: (a) performance of an operation on the cadaver, (b) problems in fractures and dislocations, with application of a bandage.

Ophthalmology: Examination and history of an assigned case (without a paper). It is not stated that an operation on a cadaver or on the eye of an animal will be required.

SECTION III

Medicine and Materia Medica: Clinical examinations under the same rules as for Surgery. In a separate session, problems in materia medica, toxicology and prescribing.

SECTION IV

Obstetrics and Gynecology: (a) Observation of a birth; examination. History of a confinement, in writing, accompanied by the candidate's declaration that he has received no assistance. Seven days'

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Medical Jurisprudence: An oral examination.

All examinations oral.

Graduation: Function of the university, not of the faculty, with the rector presiding, in the presence of the dean of the faculty of professors, the candidate being presented by a full professor of the medical faculty.

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observation of a patient during the lying-in period. (b) Examination on the model. Operation.

SECTION V

Final Oral Examination: By at least three of the board members who have already officiated, and one new member for hygiene, the chairman of the entire examining board presiding.

General and special pathology, surgery, materia medica, public sanitation or hygiene.

Certificate in German.

Here and there in the German Empire, university graduations still retain certain traditional, distinctive, local features; but many of these are common to all. The prerequisites are a certificate of graduation from a *Gymnasium,* a certificate showing the successful completion of the *tentamen physicum,* and proof of the completion of four years of academic study. The doctoral examination proper is preceded by an oral and written test set by the dean. The examination itself is conducted orally in the presence of the assembled teaching staff (including, however, only the full professors). Usually all ask questions, each man in his own subject. Where the faculties are large, as for example, at Berlin, the number of examiners is usually limited to the senior professors. Only at certain universities, at which the professors of natural science are still members of the medical faculty (e.g., chemistry and botany at Göttingen), are these subjects included in the doctoral examination. As a rule the examination is limited to medical subjects.

After the examination has been passed, the candidate for the degree must have a dissertation printed; then follow public defense of theses, proclamation and diploma. The conferring of the degree is entirely a faculty function.

Until very recently examinations, both preliminary and final, dissertation, disputation, graduation and diploma were all in Latin. Now German is used nearly everywhere and only the diploma is commonly couched in Latin. The ceremonies vary, according to ancient customs. A survival of the old doctors' feast is to be found at some universities (e. g., even at Berlin) in the custom of serving wine and cake in the intermissions of the examinations, which refreshments are furnished by the dean.

Public Health Service.—I have already mentioned the examination for district physicians which was introduced in Prussia in 1825 and is still given. By an order of the Ministry of the Interior dated March 21, 1873, an examination "for physicians who wish to obtain permanent employment in the public health service of the municipal authorities" was introduced. The most important paragraphs of the rules governing these examinations read as follows:—

The requirements for admission are:

(a) proof that the applicant possesses the degree of Doctor of Medicine granted by a university within the Empire;

(b) a certificate showing the required attendance at a psychiatric clinic, including proof of having passed the oral examination at the end of this course with a good record; or a certificate showing that he has attended and studied treatments for at least three months at a public insane asylum; or a certificate showing medical employment at an insane asylum;

(c) proof of attendance at a theoretical and practical course in vaccination and of lectures on veterinary sanitation and animal epidemics;

(d) proof that the candidate, after obtaining his doctor's diploma, has served at least two years in a public hospital, or has been in private practice for at least three years.

The examining board consists of five examiners under the chairmanship of the Commissioner of Public Sanitation. The examinations cover: hygiene and the public health laws, medical jurisprudence, including forensic psychology, pharmacognosy, including a knowledge of the common poisons, chemistry with reference to the needs of district physicians, and veterinary sanitation. The written examination, for which twelve hours are allowed and which is supervised by a proctor, consists of two questions. The practical examination is given at a public hospital and in a chemical laboratory. It includes a post-mortem examination, with the dictation of a report in legal form, an opinion on the condition of an injured or insane person, a qualitative chemical analysis, identification of pharmacological objects, including microscopic examinations. Oral examination (public) in all the subjects listed above. Questions to be drawn by lot.

The Examination in Russia.—In Russia the conditions with respect to the examinations leading to the right to practise are like those in Austria, in so far as they are given only at the universities and are conducted only by the teaching staffs. The latter are not, however, subject to a continual supervision by government commissioners. On the other hand, there is a similarity to conditions in the German Empire in that the right to practise may be granted without the doctor's degree. The rules that govern all Russian universities apply also at the German University of Dorpat in Russia. The degrees obtained there give the right to practise throughout the Russian Empire.

In order to study medicine and to be admitted to the medical examinations, a certificate of graduation from a *Gymnasium* is required, together with evidence of a five-year medical course, and a certificate showing successful completion of the subsidiary sciences: physics, chemistry, botany, zoölogy, mineralogy. At Dorpat the course is elective. A curriculum designed for the five-year course at the other Russian universities is suggested and is usually followed.

There are several degrees, which all equally entitle the holder to practise, except that the holders are variously classified if they enter the service of the state. The first degree is that of "Physician"; the examination is arranged much like the state examination in the German Empire and the *Rigorosa* of Austria; in difficulty, so far as I am able to judge from the form and content of the rules, it lies midway between these two examinations.

In order to obtain the second degree, that of Doctor of Medicine, the first degree must have been obtained. Thereupon there are two written examinations, under supervision. Dorpat puts unusual emphasis on the dissertation. At any rate, the best dissertations produced in all the German universities are now as a rule written at Dorpat. Then follow the defense of the thesis, and graduation.

The third and highest degree is that of Doctor of Medicine and Surgery. Only doctors of medicine are admitted to this degree. The examination is chiefly in surgery, and is both written and technical (operative). This degree does not offer special privileges in the public service, and is therefore seldom taken. It has almost fallen into disuse.

A person wishing to become a health officer in the public service must take the examination either for "district physicians" or for the post of an "inspector of a medical precinct." These examinations correspond approximately to the examinations for district surgeon and district physician in Prussia under the rules of 1825.

The Swiss Examinations.—In Switzerland, until 1868, conditions were very complicated. Each canton had its own state examination, and only a person who had passed these could practise in any given canton, there being no freedom to move from one canton to another. The faculty examination and graduation at the Universities of Basel, Bern, and Zurich did not give the right to practise either in these or in other cantons. Although physicians did not have to be doctors, they usually took the doctor's degree at one of the universities named, or at another German university. The standards of the different state examining boards in the cantons varied greatly, of course, with the knowledge of their members. In the small cantons (e. g., Zug, with 10,000 inhabitants) it is probable that all the physicians in the country formed the examining board, and could control the admission of new competitors to practice.

The state examination in the neighboring canton of Zurich was always chiefly in the hands of the professors, and was quite on a level with the examinations in the German Empire and Austria. It was quite sensible and natural that the government of Zurich should protect its physicians, who had been subjected to a severe test, from the competition of those who had passed the easy examinations in other cantons, and that it should refuse all efforts on the part of the latter to establish themselves within its borders. On the other hand, the small and poorer cantons of the mountains feared, not without reason, that if the examinations were made too difficult they would have no physicians at all, while in the cities the native physicians might be driven out by competition from outside. Finally, there prevails in Switzerland an almost superstitious fear of any sort of centralization. It was a long time before all these difficulties were overcome.

In 1867 (Resolution of the Bundesrat, August 2, 1867) an agreement was finally formulated by the cantons Zurich, Bern, Schwyz, Glarus, Solothurn, Schaffhausen, Appenzell a. R., St. Gall, and Thurgau, giving to Swiss medical men the right to practise freely in the cantons that were party to the convention. By 1868 the cantons of Basel-City, Lucerne, Uri, Zug and Basel-Land had joined the convention. Under rather complex conditions, examining boards with four-year terms were established at Basel, Bern and Zurich, to meet at the beginning and the end of each semester. Although there is no requirement to this effect in the rules, the professors of the university are generally the examiners, and the university laboratories are a material help in conducting the examinations. It is important that each part of the practical examination is conducted by two examiners, and that three members of the examining board at least are present at every oral examination.

The examination giving the right to practise (but not the doctor's degree) in the cantons party to the convention falls into two separate parts:

1. *The preparatory examination.* This may be taken "during the period of study," whatever that may mean. Requirements for admission: Certificate of graduation from a *Gymnasium,* certificates showing completion of courses in physics, chemistry, including laboratory work, anatomy, physiology, and a complete course in laboratory preparations. In the written examinations the candidate must pass two papers, one in physics or chemistry, the other in anatomy or physiology. Oral examination in botany, zoölogy and comparative anatomy, physics, chemistry, anatomy and histology, physiology.

2. *Professional examination.* Requirements for admission: Certificate showing that the preparatory examination has been passed; certificate of attendance at the following medical courses: Pathological anatomy, medical jurisprudence, a one-semester course in theory of operations and dressing wounds, medical clinic for three semesters, surgical clinic for three semesters. Evidence of employment for a semester as an assistant in a hospital ward may be offered in place of one clinic.

The practical examination consists of:

1. Examination and diagnosis of two medical and two surgical cases and of one obstetrical case.

2. Written consultations on one of the two medical cases and on one of the two surgical cases.

3. Dissection upon a cadaver, together with an oral exposition.

4. Performing two operations, including the tying of an artery, together with the application of bandages.

5. A paper on a case in medical jurisprudence, with findings and opinion.

At the oral examination the following subjects are covered: General pathology and pathological anatomy, special pathology and therapy, including children's diseases and psychiatry, hygiene, materia medica and prescribing (including a knowledge of the materials used), surgery, topographical anatomy, and the theory of operations, obstetrics and gynecology, medical jurisprudence.

The examinations for the doctor's degree at the Swiss universities vary somewhat. Basel and Zurich demand that the candidate be matriculated at the university. At Bern this is not necessary. Bern and Basel demand a certificate showing completion of academic courses. Zurich, on the other hand, requires evidence of completion of courses in physics, chemistry, mineralogy, botany, zoölogy, anatomy, physiology, general pathology and therapy, materia medica, special pathology and therapy, surgery, obstetrics, medical clinic, surgical clinic (each for two semesters), obstetrical clinic, pharmacology. The examination itself, like that in Bern and Basel, does not include the natural sciences.

At Bern and Basel an acceptable dissertation must first be handed in. Not until this has been approved does the examination begin; in Zurich the dissertation is not required until after the examination.

At Basel written proctored examinations precede the oral examination before the assembled faculty. At Bern there are no such written *tentamina*.

At Zurich there is a public disputation of theses, conducted in German, before the assembled faculty, in which several professors take part and which is followed by the official graduation, with the administering of the oath, and a diploma without gradation of honors. At Bern there is neither disputation nor oath, and the diploma is also without honors. At Basel no disputation is required, but the applicant takes the oath administered by the dean in the presence of the assembled faculty. At Basel the degree is granted with the ancient honors: *summa cum laude, cum laude, insigni cum laude, magna cum laude, rite.*

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